IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

Ash Canal, Imperial Valley Photo from the Daily Digest Weekend Edition: https://mavensnotebook.com/2017/09/17/daily-digest-weekend-edition-follow-the-money-delta-tunnel-foes-try-new-strategy-fishing-industry-concerned-about-fall-salmon-season-parks-and-water-improvements-likely-to-be-on-californias-201/

December 26, 2015
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

October 5, 2018

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ACRONYM DESCRIPTIONS

AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP/PSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
LST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On December 26, 2015, a State and Local Ambient Air Monitoring Station (SLAMS) located in Westmorland (AQS Site Code 06-025-4003), California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). Both the Federal Referenced Method (FRM) Size-Selective Inlet (SSI) High Volume Gravimeter sampler and the Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 165 µg/m^3 and 198 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements measured above the 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Westmorland was the only monitor in Imperial County to measure an exceedance of the PM_{10} NAAQS on December 26, 2015.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON DECEMBER 26, 2015

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
12/26/2015	**Westmorland**	**06-025-4003**	**1**	**24**	**165**	**150**
12/26/2015	**Westmorland**	**06-025-4003**	**3**	**24**	**198**	**150**
12/26/2015	Brawley	06-025-0007	1	24	101	150
12/26/2015	Calexico	06-025-0005	1	24	55	150
12/26/2015	El Centro	06-025-1003	1	24	93	150
12/26/2015	Niland	06-025-4004	1	24	73	150
12/26/2015	Brawley	06-025-0007	3	24	132	150
12/26/2015	Niland	06-025-4004	3	24	132	150
12/26/2015	El Centro	06-025-1003	3	23	102	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On December 26, 2015, the Westmorland monitor affected by elevated particulate matter caused by the entrainment of fugitive windblown dust from strong gusty north to northeast winds fueled by a building cold low-pressure system over the southwest states and a strong cold surface high pressure over the Great Basin blew across southern California and into Imperial County.[2]

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2015, Pacific Daylight Time (PDT) is March 8 through November 1. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

[2] Area Forecast Discussion National Weather Service San Diego CA 926 PM PST Friday, December 25, 2015 and 348 AM PST; 901 AM PST; 109 PM PST; 339 PM PST Saturday, December 26, 2015

This report demonstrates that a naturally occurring event caused an exceedance observed on December 26, 2015, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains of the Sonoran Desert, and portions of the southern Mohave Desert, to the north of Imperial County. The document further substantiates the request by the ICAPCD to flag PM_{10} 24-hour NAAQS exceedance of 165 µg/m^3 and 198 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[3].

I.1 Demonstration Contents

Section II - Describes the December 26, 2015 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the event affected air quality. Overall, this section provides the evidence that the event was a natural event.

Section III - Using time-series graphs, summaries and historical concentration comparisons of the Westmorland monitor, this section discusses and establishes how the December 26, 2015 event affected air quality demonstrating that a clear causal relationship exists between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the December 26, 2015 event and its resulting emissions defining the event as a "natural event".[4]

Section IV - Provides evidence that the event of December 26, 2015 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

[3] "Treatment of Data Influenced by Exceptional Events; Final Rule", 72 FR 13560, March 22, 2007

[4] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published the National Weather Service (NWS) extended Holiday forecast synopsis from the San Diego and Phoenix offices. The ICAPCD published notice described two weather systems; the first system expected to affect the region through Christmas Eve, bringing strong and gusty winds along with rain and snow through the San Diego Mountains and deserts. The second system expected to affect the region through Saturday December 26, 2015, would bring cold air and gusty northerly winds accompanied by blowing dust. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County on December 26, 2015. **Appendix A** contains copies of notices pertinent to the December 26, 2015 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. Notification occurs when an agency submits a request, which includes an initial event description, for flagging data in AQS.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an “Initial Notification of Potential Exceptional Event” (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentration from the Westmorland monitor on March 7, 2016. Subsequently there after the ICAPCD sent a revised request on March 18, 2016 providing additional information describing the event. **Table 1-1** above provides the correct concentration for Westmorland. The difference in concentrations between local and standard has an insignificant impact on any data analysis. The submitted request included a brief description of the meteorological conditions for December 26, 2015 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on March 12, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 165 µg/m^3 and 198 µg/m^3 (**Table 1-1**), which occurred on December 26, 2015 in Westmorland. The final closing date for comments was April 11, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2015.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the December 14, 2015 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on December 26, 2015, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

a The event created the meteorological conditions that entrained emissions and caused the exceedance.
b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
d The event "is not reasonably controllable and not reasonably preventable."
e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."
f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II December 26, 2015 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the December 26, 2015 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert, which is an extension of the larger Sonoran Desert (**Figure 2-1)**. The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center, the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion, which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994).

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas.

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter)

mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

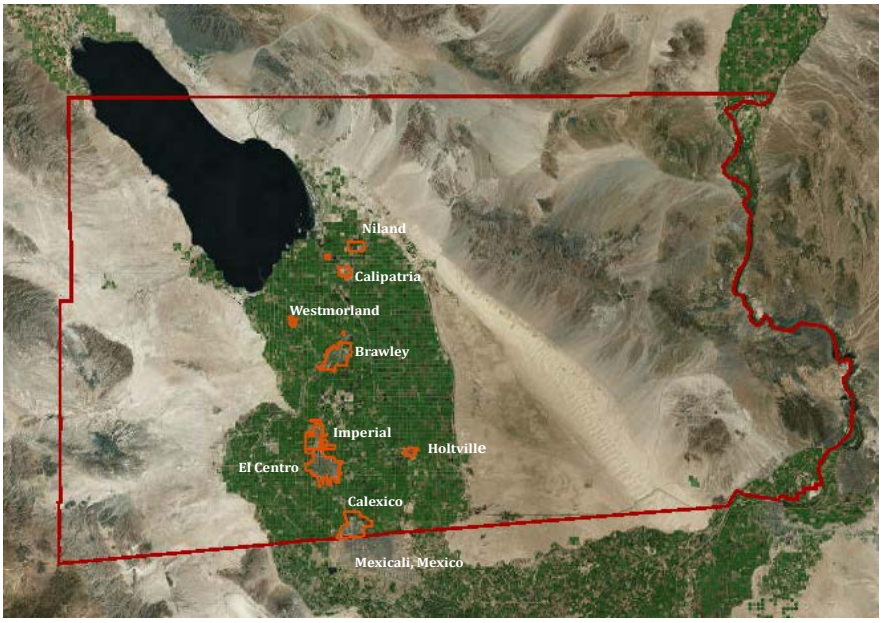


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County, four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedances on December 26, 2015, occurred at the Westmorland monitor. The Brawley, Niland and Westmorland monitors are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on December 26, 2015, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

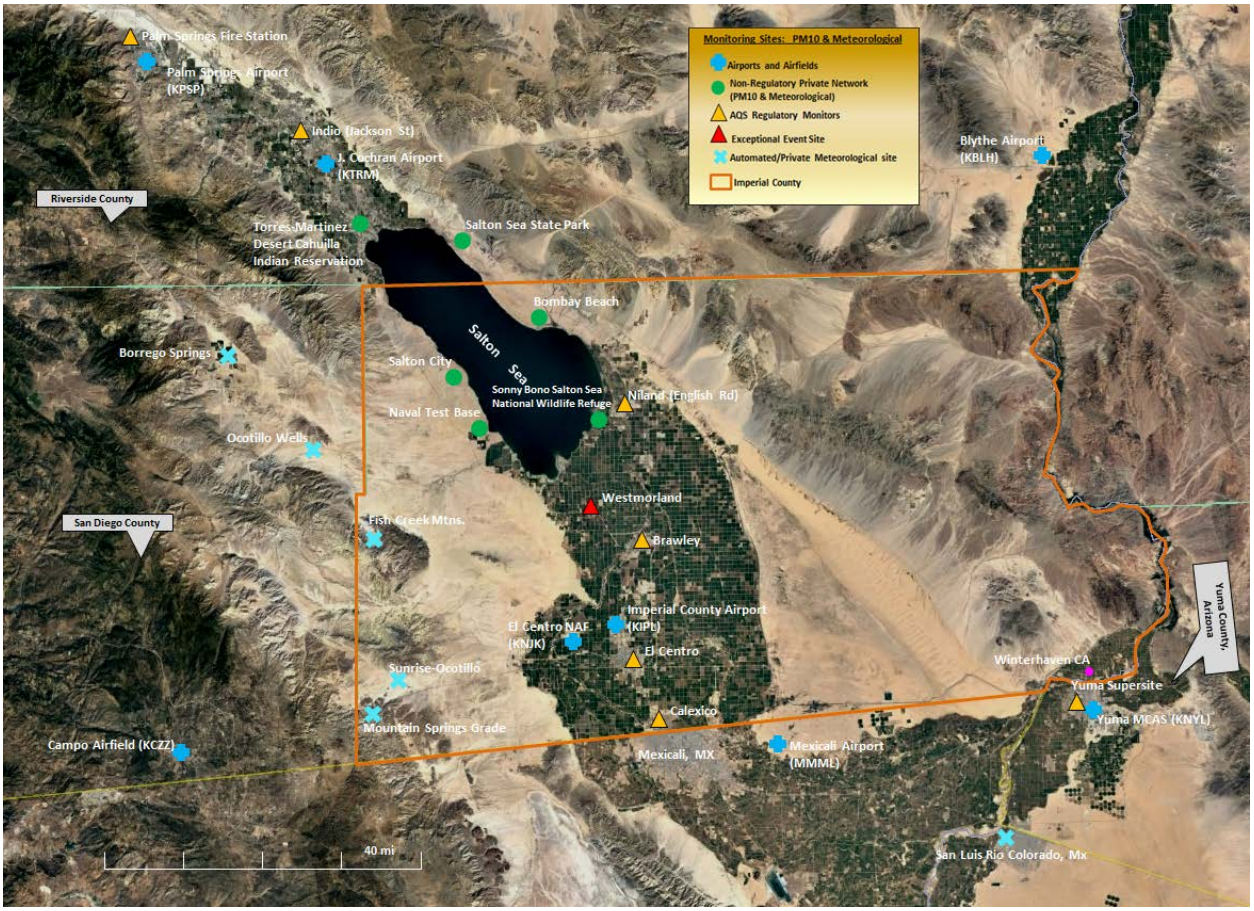


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These privately owned stations are non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral

vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

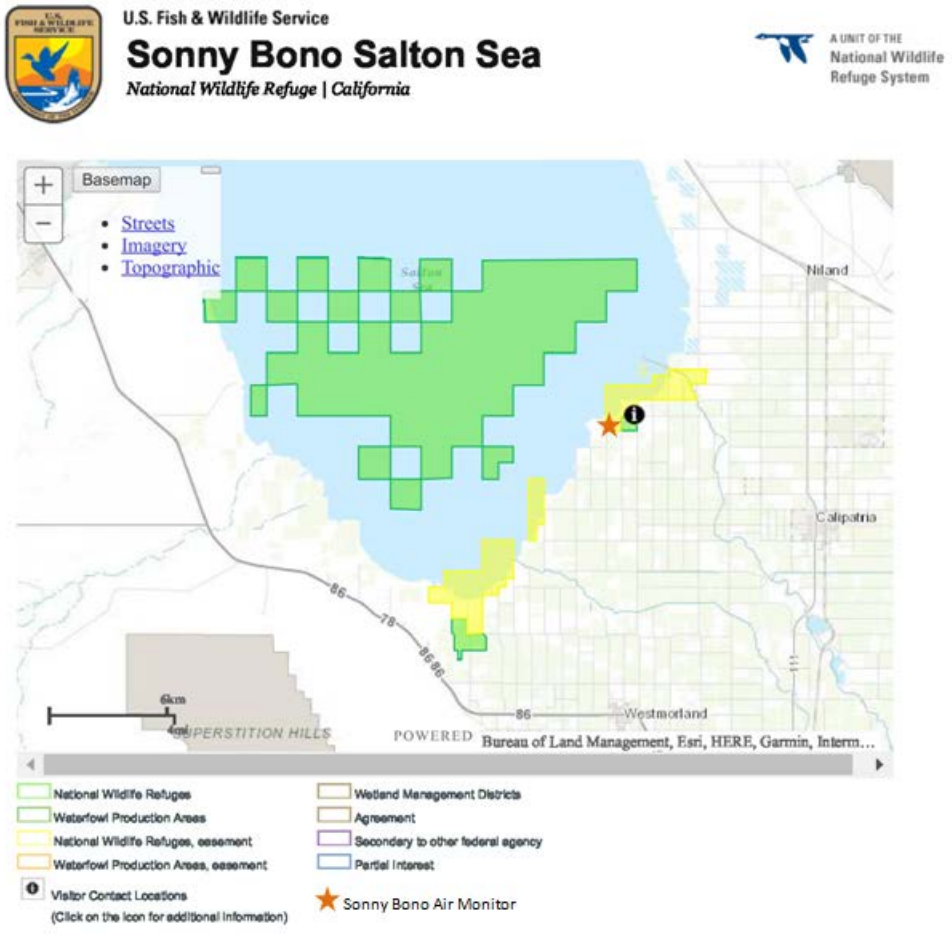


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
DECEMBER 26, 2015

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} ($\mu g/m^3$) Avg	1-hr PM_{10} ($\mu g/m^3$) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	101	-	-	-	-
		BAM 1020					132	702	900		
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	(81102)	13698	3	55	-	-	18	1100
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	(81102)	13694	9	93	-	-	15.5	900
		BAM 1020					102	342	1000		
Niland-English Road	ICAPCD	Hi-Vol Gravimetr	06-025-4004	(81102)	13997	-57	73	-	-	27.9	1400
		BAM 1020					132	678	1100		
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	(81102)	13697	-43	165	-	-	18.6	900
		BAM 1020					198	742	1000		
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	13	39	2100	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	91	489	400	-	-
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	400	1,217	800	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region demonstrated when historical annual average precipitation levels in Imperial County average 3.11" (**Figure 2-16)**. During the 12-month period prior to December 26, 2015, Imperial County measured a total annual precipitation of 1.61 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTRY HISTORICAL WEATHER

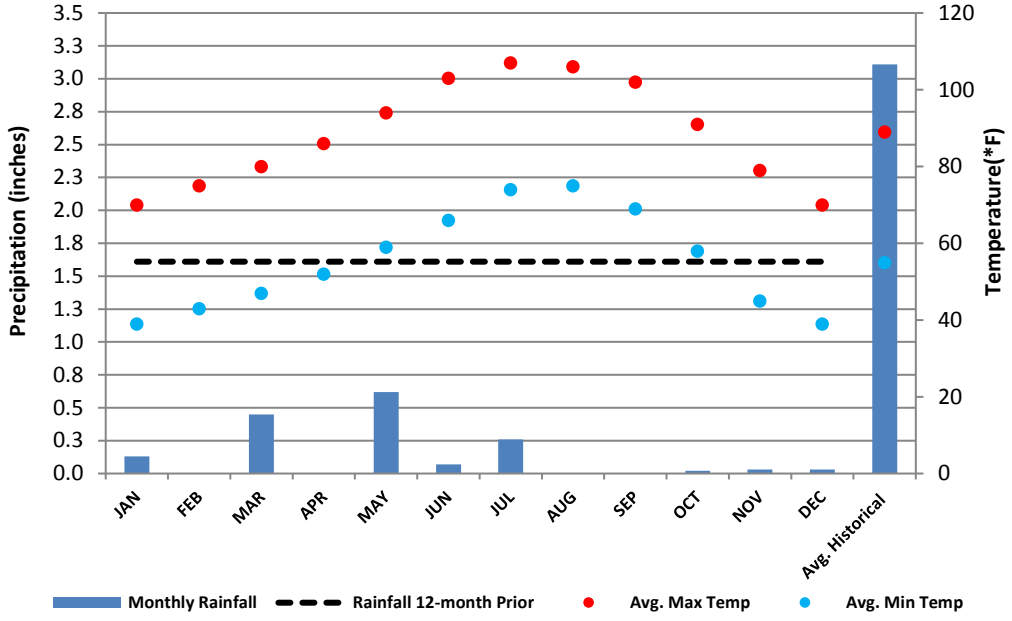


Fig 2-16: Historical Imperial County weather. Prior to December 26, 2015, the region suffered abnormally low total annual precipitation of 1.61 inches. Average annual precipitation is 3.11 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground
https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[5] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for December 26, 2015, caused by a low-pressure system and secondary frontal boundary moved through the region through Saturday and brought cooler temperatures and very windy conditions.[6] According to the NWS, a strong surface high-pressure developed over Nevada as a shortwave trough and associated jet moved southeast. The combination set off strong winds particularly over the northern portions of the region.[7] The north winds aloft behind the low pressure and strong cold surface high pressure over the Great Basin created strong gusty north to northeast winds along and below mountain slopes and deserts with the strongest winds during the afternoon hours of December 26, 2015.[8]

By 0806 PST, Saturday December 26, 2015, the Area Forecast discussion issued by the Phoenix NWS office reported a strong surface high pressure over Northern Nevada and Idaho, which

[5] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html
[6] Area Forecast Discussion National Weather Service Phoenix AZ 715 PM PST (815 PM MST) December 25, 2015
[7] Area Forecast Discussion National Weather Service San Diego CA 140 PM PST and Phoenix 144 PM PST (244 PM MST) Friday, December 25, 2015
[8] Area Forecast Discussion National Weather Service San Diego CA 926 PM PST Friday, December 25, 2015 and 348 AM PST; 901 AM PST; 109 PM PST; 339 PM PST Saturday, December 26, 2015

helped to set up a pressure gradient across the desert southwest. The discussion by the Phoenix NWS office identified currently occurring gust above 40 mph and blowing dust. Similarly, at 0901 PST the San Diego NWS office reported elevated winds with gusts between 55 and 75 mph in many northwest areas of San Diego County as the surface pressure gradient tightened. **Appendix A** including the **Appendix A-Supplemental** contain copies of all pertinent notices to the December 26, 2015 event.

On December 26, 2015, strong north to northeast winds blew along mountain slopes and naturally open areas within San Diego and Riverside Counties affecting air quality and causing an exceedance at the Westmorland monitor.

Figures 2-17 through 2-20 provide information regarding the location of the high-pressure the related clouds and resulting northerly winds responsible for the exceptional event that affected the Westmorland monitor on December 26, 2015.

FIGURE 2-17
HIGH PRESSURE OVER WESTERN STATES DECEMBER 26, 2015

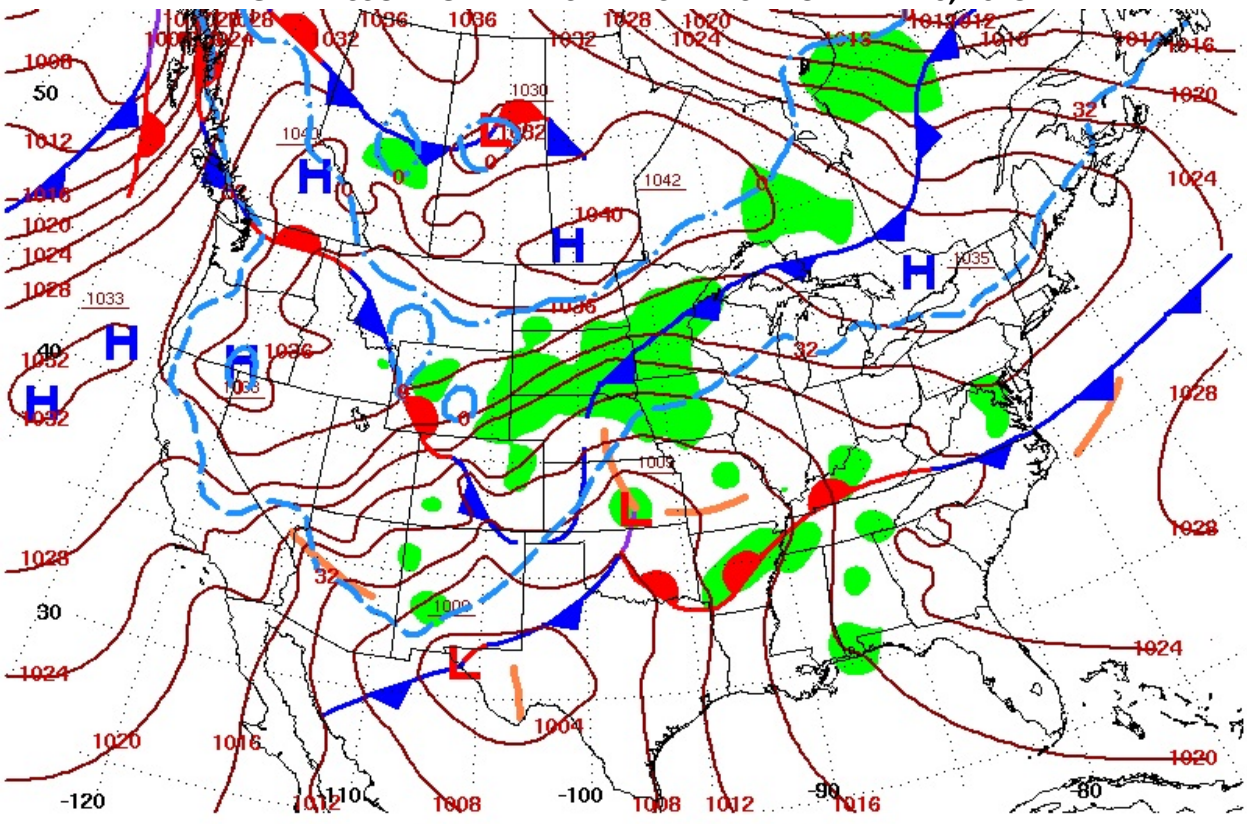


Fig 2-17: A daily weather map (0400 PST) for December 26, 2015, identifies the high pressure over western states. The north winds aloft behind the low pressure and the cold surface high pressure over the Great Basin brought strong gusty north to northeast winds. Source: National Centers for Environmental Prediction, Weather Prediction Center

FIGURE 2-18
STRONG NORTHERLY WINDS ACROSS SE CALIFORNIA

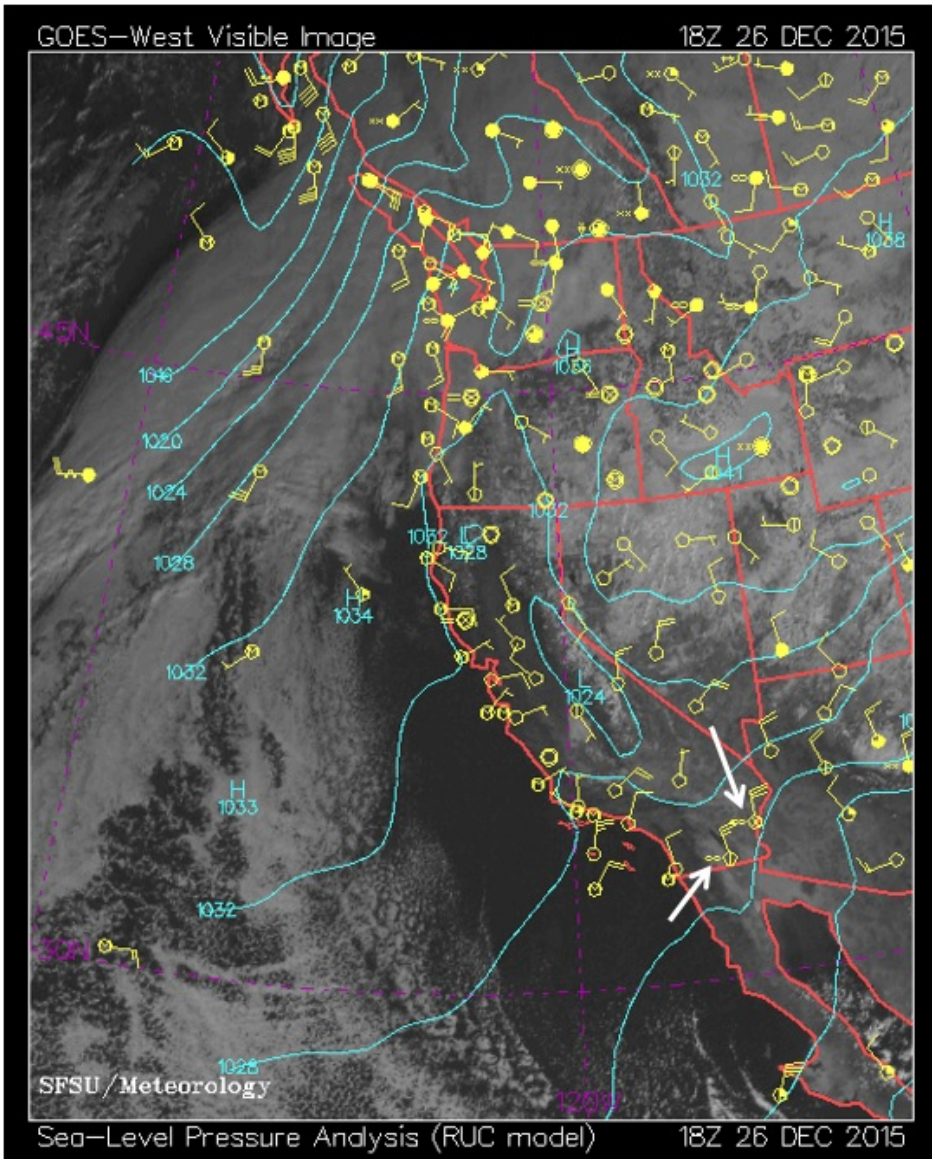


Fig 2-18: A visible sea-level pressure analysis composite map captured by a GOES-W satellite on December 26, 2015 at 1000 PST. Wind barbs over southeastern California indicate strong (~28 to 34 mph) northerly winds. Symbols (∞) indicated by white arrows signify observed haze. Source: SFSU Department of Earth and Climate Sciences and the California Regional Weather Server. For explanation of symbols go to http://www.wpc.ncep.noaa.gov/html/stationplot.shtml

FIGURE 2-19
CONUS VISIBILE SATELLITE IMAGE DECEMBER 26, 2015

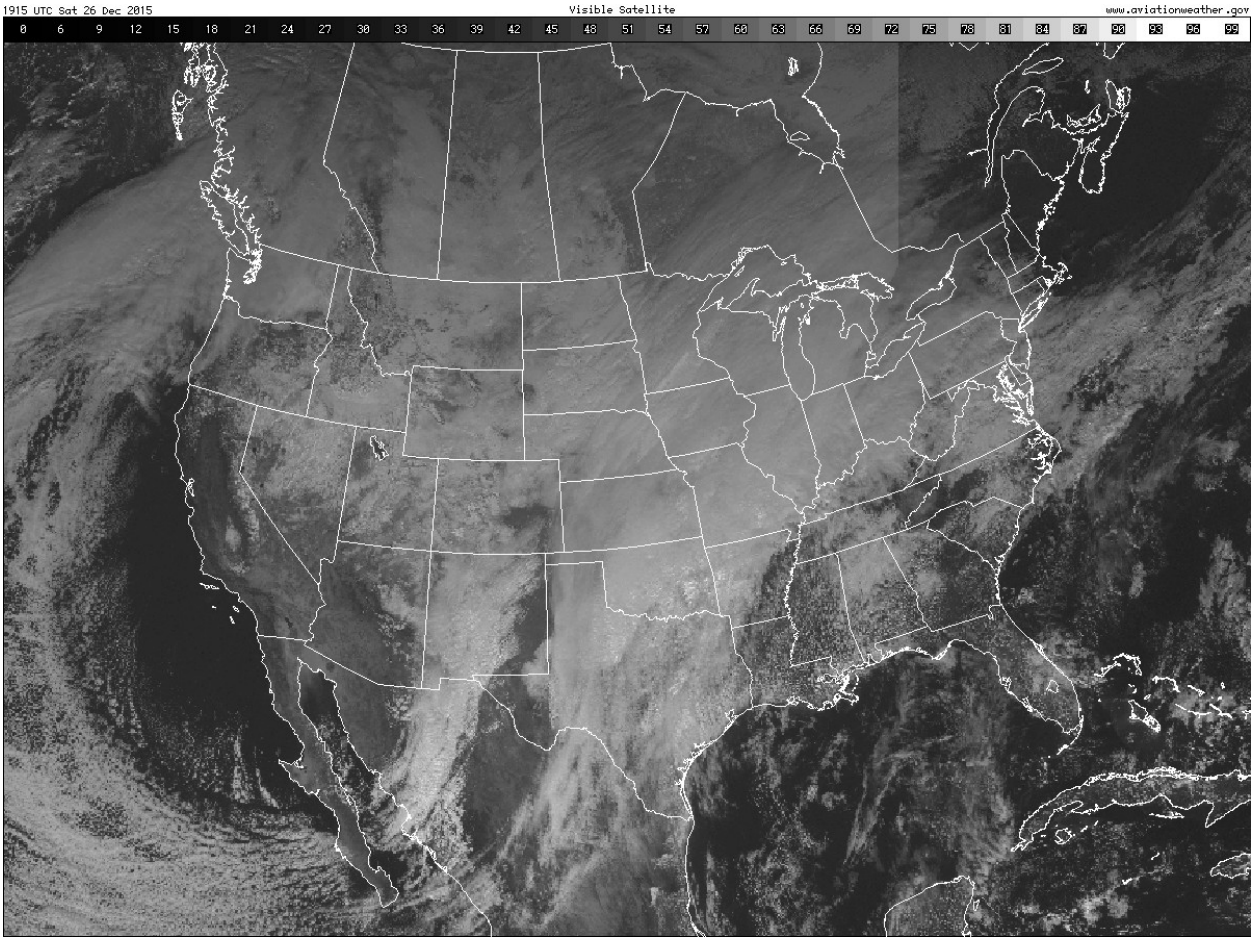


Fig 2-19: A CONUS visible satellite image (1115 PST) on December 26, 2015, shows the surrounding clouds and high pressure over southern California, southern Nevada, and western Arizona. Source: https://aviationweather.gov/

FIGURE 2-20
SURFACE GRADIENT TIGHTENS DECEMBER 26, 2015

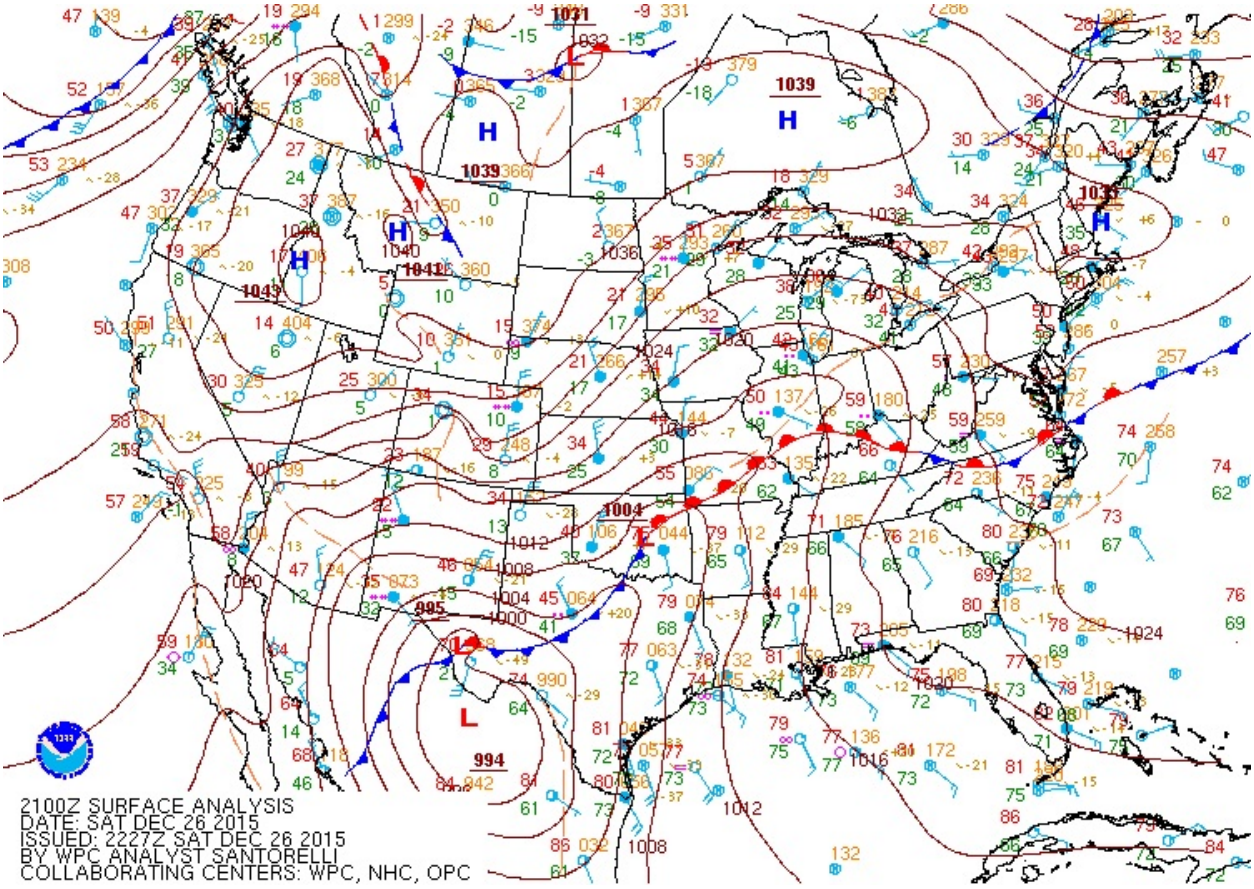


Fig 2-20: A surface analysis map (1300 PST) on December 26, 2015, illustrates the tightening of the surface gradient over much of the Southwest. Wind barbs indicating moderately strong (~28 to 34 mph) northerly winds over southeastern California, southern Nevada, southwestern Utah, and Arizona. Source: Weather Prediction Center Surface Analysis Archive
http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive.php

As mentioned above, a low-pressure system and secondary frontal boundary moved through the region through December 26, 2015 bringing cooler temperatures and very windy conditions. The cold front moved across southern California the evening of Christmas Eve and Christmas morning causing light snow showers across the northern mountains and patchy frost in the valleys.[9] In fact, the San Diego NWS office issued an Urgent Weather Message at 1001 PST on December 25, 2015 cancelling an existing wind advisory only to reissue a High Wind Warning, High Wind Advisory and Frost Advisory the same day at 1305 PST in anticipation of expected increasing gusty northeast winds during the evening hours of December 25, 2015.[10] The wind advisory remained

[9] Area Forecast Discussion National Weather Service San Diego CA 249 AM PST; 948 AM PST; 915 PM PST Thursday December 24, 2015 and 305 AM PST; 140 PM PST Friday, December 25, 2015

[10] A wind advisory is issued when the following conditions are met for one hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016,

in effect for wind-prone desert slopes and adjacent deserts through 1000 PST. Similarly, the Phoenix NWS office discussed the persistence of thicker cloud cover through Christmas with a moist low level allowing for isolated showers across the higher terrain of Central Arizona. This is significant because as the level of moisture, whether rain or snow, increased within the mountain and open desert areas within Riverside County and Arizona the level of suspended windblown dust decreases, less saltation thus less deposition.[11]

FIGURE 2-21
24 HOUR PRECIPITATION AREAS AND AMOUNTS

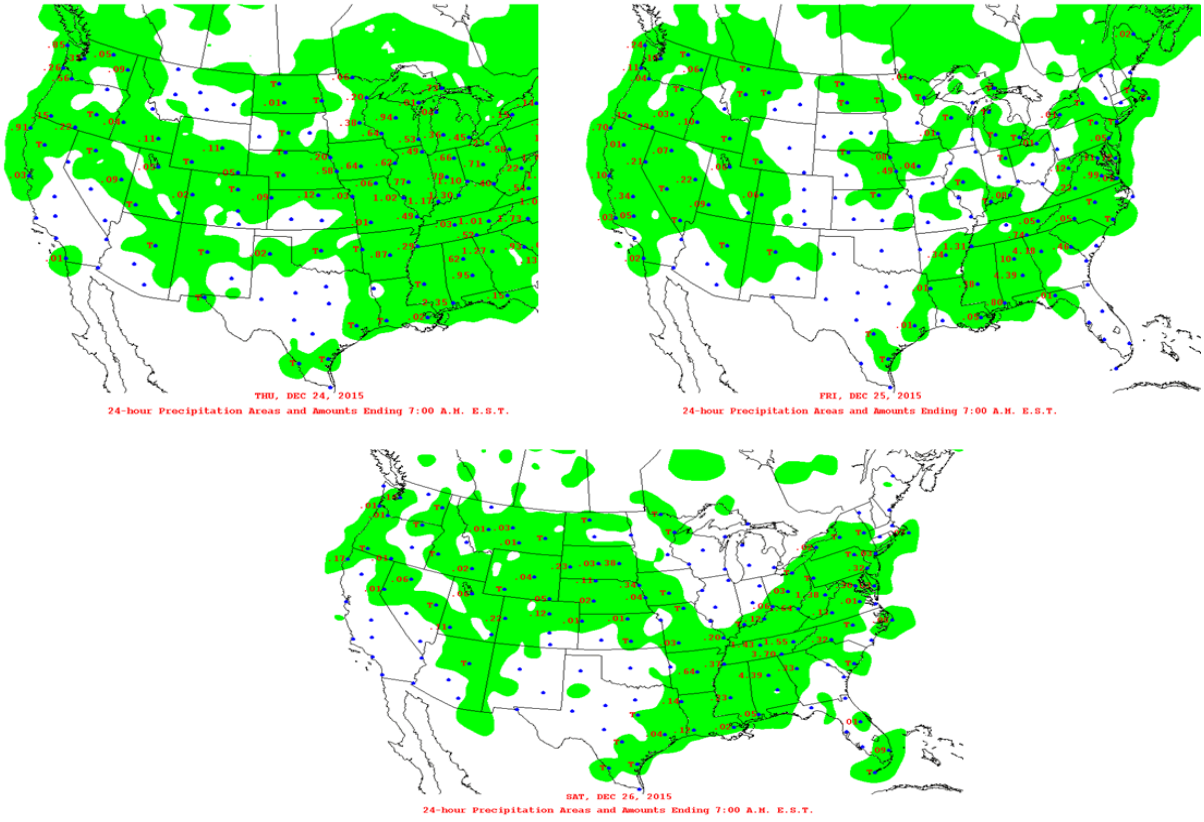


Fig 2-21: 24-hour precipitation Daily Weather Maps (0400 PST) issued by the Weather Prediction Center, help illustrate the analysis observations by the NWS for the total precipitation levels for December 24, 2015 through December 26, 2015.[12] Source: Weather Prediction Center Daily Weather Maps https://www.wpc.ncep.noaa.gov/dailywxmap/index_20151224.html

http://www.weather.gov/lwx/WarningsDefined#Wind and a High Wind Warning is issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. A High Wind Watch is issued when these conditions may be met 12 to 48 hours in the future

[11] Area Forecast Discussion, National Weather Service Phoenix AZ, 309 PM MST (209 PM PST) Thursday, December 24, 2015.

[12] The National Oceanic and Atmospheric Administration, National Weather Service, National Centers for Environmental Prediction, Hydrometeorological Prediction Center & Climate Prediction Center web page for the Daily Weather Maps explains that the Precipitation Areas and Amounts charts shows areas that had precipitation during the 24 hours ending at 700 AM EAST with amount to the nearest hundredth of an inch. "T" indicates a trace of precipitation. https://www.wpc.ncep.noaa.gov/dailywxmap/explaination.html

All monitors in Imperial County, except the Calexico monitor, measured elevated concentrations. However, only the Westmorland monitor measured sufficient continual hourly-elevated concentrations to measure an exceedance. The Brawley, El Centro and Niland monitors measured daily averaged concentrations above 100 µg/m^3 but failed to measure sufficient continual elevated hourly concentrations to measure an exceedance. The Calexico station did not operate a continuous monitor December 26, 2015 however the FRM SSI instrument measured the lowest 24-hour concentration of all the monitors in Imperial County.

The north winds aloft behind the low pressure and strong cold surface high pressure over the Great Basin created strong gusty north to northeast winds prompting the San Diego and Phoenix NWS offices to issue Urgent Weather Messages containing wind advisories as early as December 25, 2015, extending them through December 26, 2015. The wind advisory issued by the Phoenix NWS office at 1921 PST December 25, 2015 included Imperial County. Locally, both the Naval Air Facility (NAF) (KNJK) and the Imperial County Airport (KIPL) measured elevated wind speeds and gust throughout most of December 26, 2015. Similarly, both airports reported haze with KNJK reporting blowing dust coincident with elevated concentrations at all monitors. Finally, stations to the north and northeast of Imperial County similarly measured elevated wind speeds and gust. **Figure 2-22** is a graphical illustration of the conditions that existed for the December 26, 2015 event.

FIGURE 2-22
RAMP UP ANALYSIS DECEMBER 26, 2015

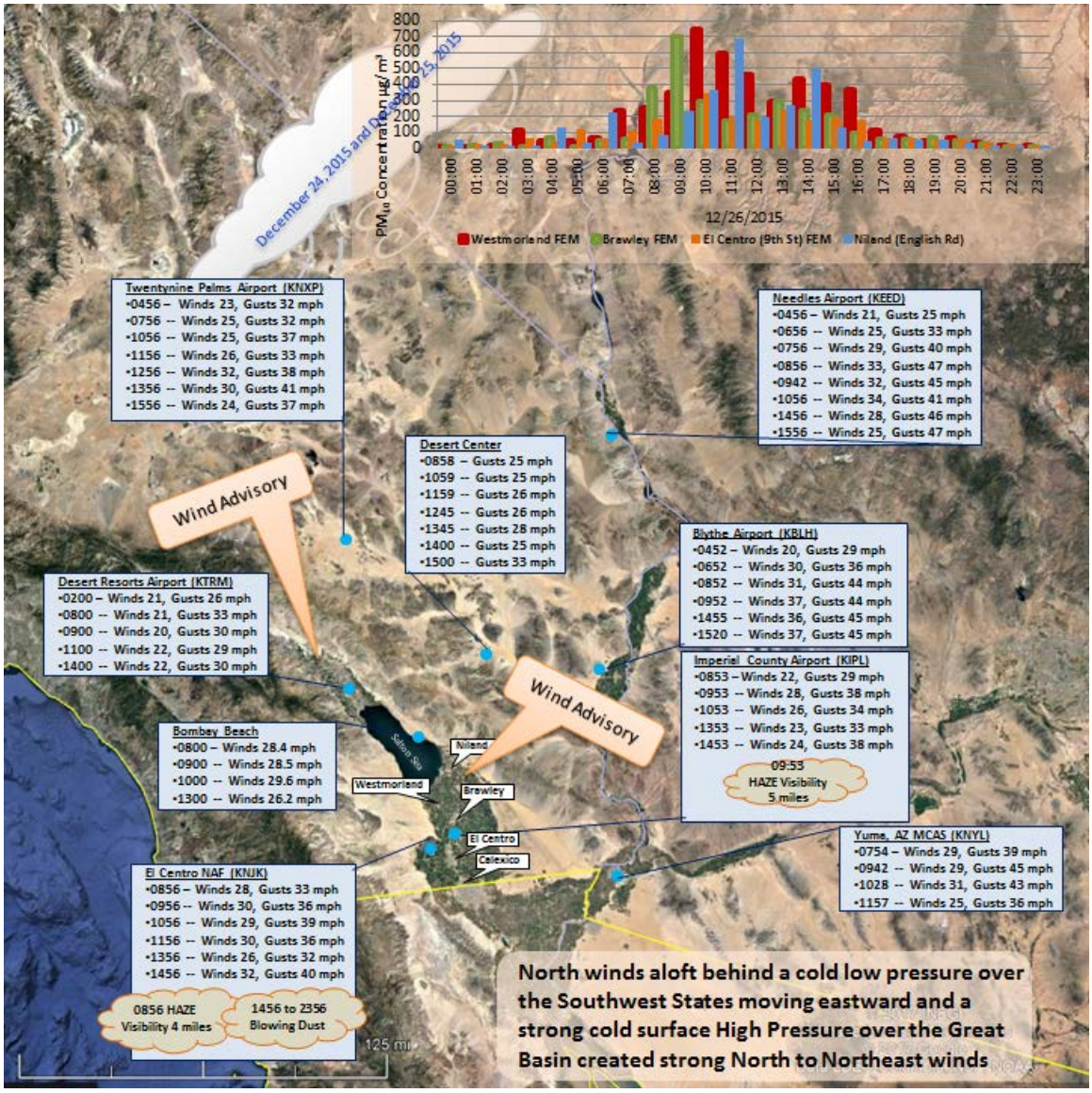


Fig 2-22: A cold High pressure over the Great Basin coupled with strong winds aloft fueled strong gusty northerly winds that blew over the natural open deserts located to the north and northeast of Imperial County affecting the air monitors. Note the position of the cloud cover at 1000 PST and 1115 PST (**Figures 2-18 and 2-19)**. Base map from Google Earth. Meteorological data from the University of Utah's MesoWest system and the NCEI's QCLCD system

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON DECEMBER 26, 2015

Station Monitor Airport Meteorological Data IMPERIAL COUNTY	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed			
						Wstmld	Brly	EC	Nlnd
Imperial Airport (KIPL)	28	350	953	38	953	346	702	-	229
Naval Air Facility (KNJK)	32	350	1456	40	1456	429	243	171	493
Calexico (Ethel St)	18	346	1100	-	-	593	171	189	678
El Centro (9th Street)	15.5	10	900	-	-	346	702	-	229
Niland (English Rd)	27.9	1	1400	-	-	429	243	171	493
Westmorland	18.6	355	900	-	-	346	702	-	229
RIVERSIDE COUNTY									
Blythe Airport (KBLH)	40	360	1140	49	1140	593	171	189	678
Palm Springs Airport (KPSP)	33	360	553	43	553	42	15	119	29
Jacqueline Cochran Regional Airport (KTRM) - Thermal	22	350	1152	33	852	593	171	189	678
ARIZONA - YUMA									
Yuma MCAS (KNYL)	31	360	928	45	842	257	384	179	79
MEXICALI-MEXICO									
Mexicali Int. Airport (MXL)	12.7	320	1000	-	-	742	300	342	366

*Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)
On December 26, 2015 the Calexico, monitoring site did not have a continuous PM_{10} sampler.

National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[13] **Figures 2-23 and 2-24**, illustrate the path of airflow as it travelled from the north and northeast into Imperial County ending at 1000 PST and 1700 PST. The 1000 PST hour is coincident with the peak hourly PM_{10} concentration measured at the Westmorland monitor while the 1700 PST represents the last hour of continual measured elevated concentrations.

Both trajectories provide information regarding the path of airflow commencing with the early morning hours of December 26, 2015 through 1700 PST. While the local airports measured elevated wind speeds at or above 25mph sites located to the north and northeast of Imperial County measured consistently higher winds speeds and gusts. As winds blew over natural open desert areas suspended windblown dust reached monitors as early as 0300 PST. The strongest winds occurred during the afternoon to evening hours December 26, 2015 coincident with

[13] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

elevated concentrations at monitors. Although elevated winds transported windblown dust into Imperial County moist low levels that existed Christmas Eve and Christmas, within the northern and northeastern areas around Imperial County allowed for less saltation of particles and less deposition onto the air monitors. It should be noted that modeled winds can differ substantially from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-23
HYSPLIT MODEL ENDING 1000 PST DECEMBER 26, 2015

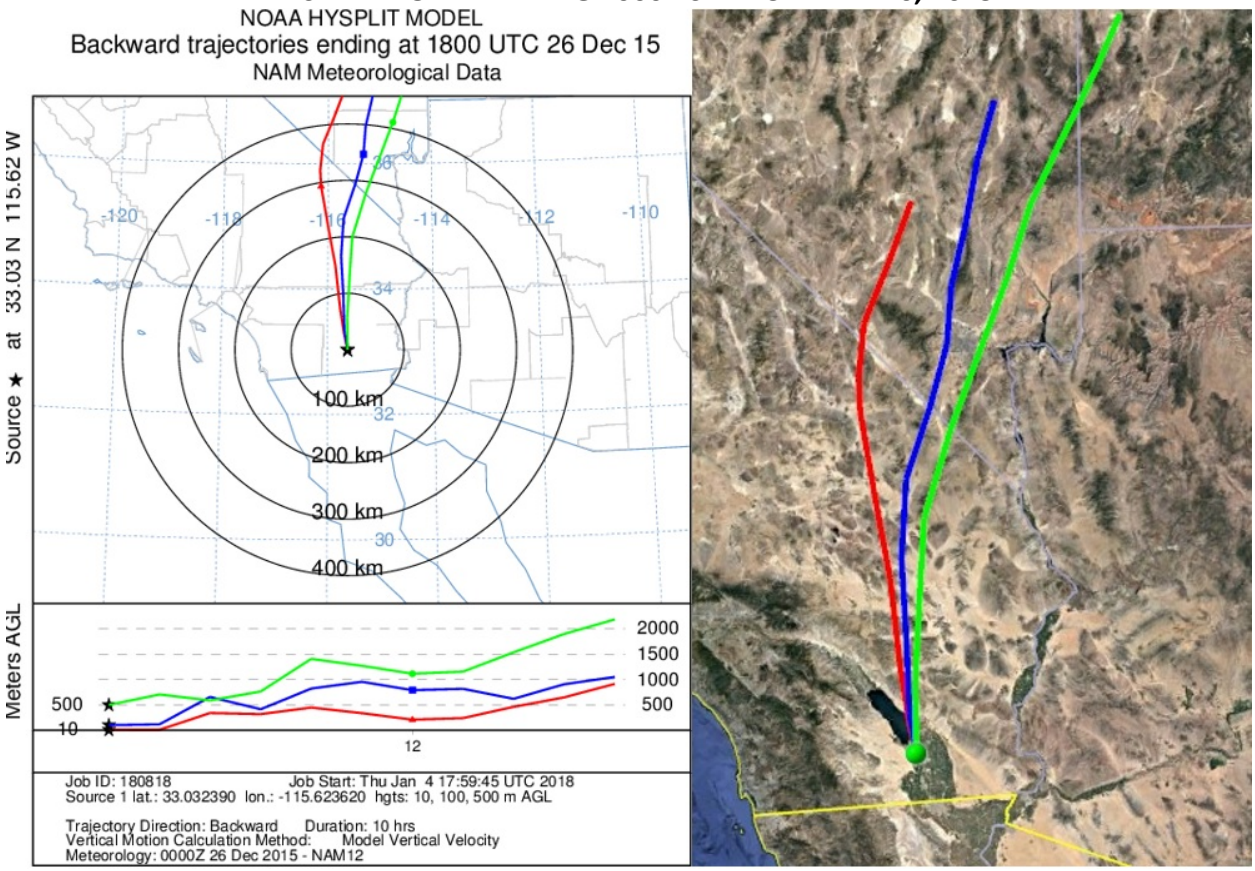


Fig 2-23: A 10-hour HYSPLIT back-trajectory ending at 1000 PST at the Westmorland monitor. Las Vegas and Lake Mead is at the upper right of the base map image. Yellow line is the international border. Red lines indicate airflow at 10 meters AGL (above ground level); blue lines indicate airflow at 100 meters AGL; and green lines indicate airflow at 500 meters AGL. Dynamically generated through NOAA's Air Resources Laboratory

FIGURE 2-24
HYSPLIT MODEL ENDING 1700 PST DECEMBER 26, 2015

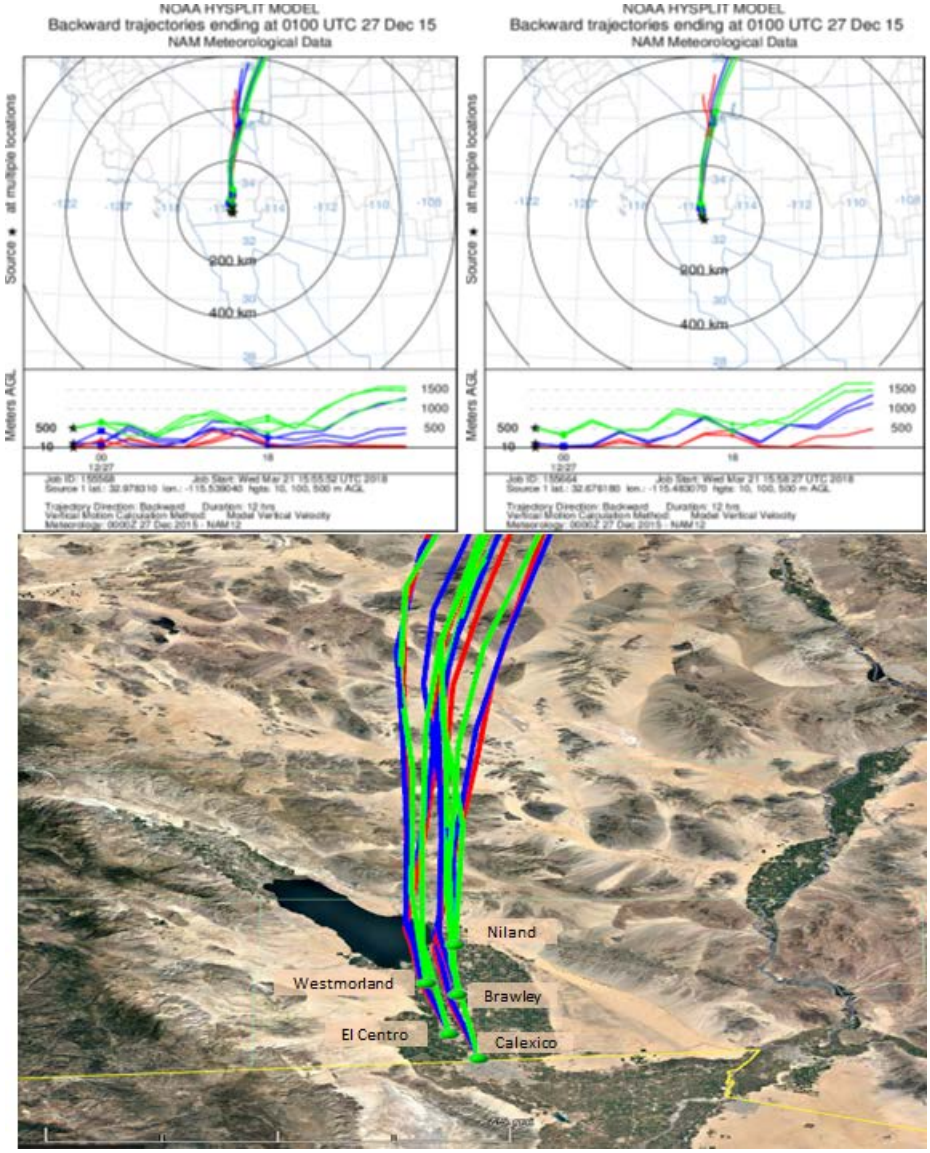


Fig 2-24: A 12-hour HYSPLIT back-trajectory ending at 1700 PST illustrates the airflow of the cold High pressure over the Great Basin coupled with strong winds aloft which fueled strong gusty northerly winds that blew over the natural open deserts located to the north and northeast of Imperial County affecting the air monitors. Yellow line is the international border. Red lines indicate airflow at 10 meters AGL (above ground level); blue lines indicate airflow at 100 meters AGL; and green lines indicate airflow at 500 meters AGL. Dynamically generated through NOAA's Air Resources Laboratory

Figures 2-25 and 2-26 illustrate the elevated levels of wind speeds and hourly PM_{10} concentrations measured in Riverside, Imperial, and Yuma counties for three days, December 25, 2015 through December 27, 2015. Elevated emissions entrained into Imperial County affected all the air monitors in Imperial County when a cold High pressure over the Great Basin coupled

with strong winds aloft fueled strong gusty northerly winds that blew over the natural open deserts located to the north and northeast of Imperial County. Although all the monitors measured elevated concentrations approximately between the hours of 0700 PST through 1600 PST, only the Westmorland monitor measured sufficient continual hourly-elevated concentrations to cause an exceedance. The measured elevated concentrations at the Westmorland monitor are coincident with the measured elevated wind speeds and gusts above 25mph.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[14] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the December 26, 2015 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event, particularly at the Westmorland monitor.

FIGURE 2-25
72 HOUR PM_{10} FLUCTUATIONS AT NEIGHBORING SITES

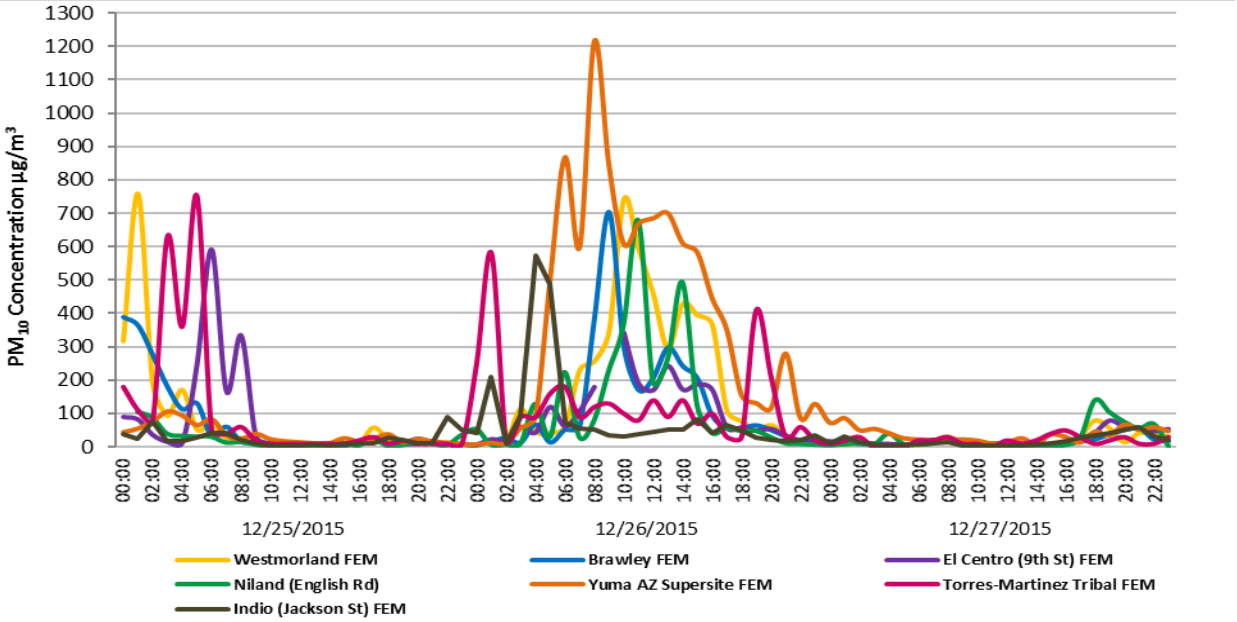


Fig 2-25: The 72-hour relative PM_{10} concentrations at various monitoring locations throughout Imperial, Riverside, and Yuma counties helps to demonstrate the regional affect from the northeast. As explained above, rain and snow fell within the mountain areas to the north and higher elevations to the northeast allowing for less saltation and deposition of particulates. In highly urbanized areas, moisture levels would have reduced suspension of particulates to a greater degree, i.e. monitor at Indio Jackson Street

[14] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-26
72 HOUR REGIONAL WIND SPEEDS

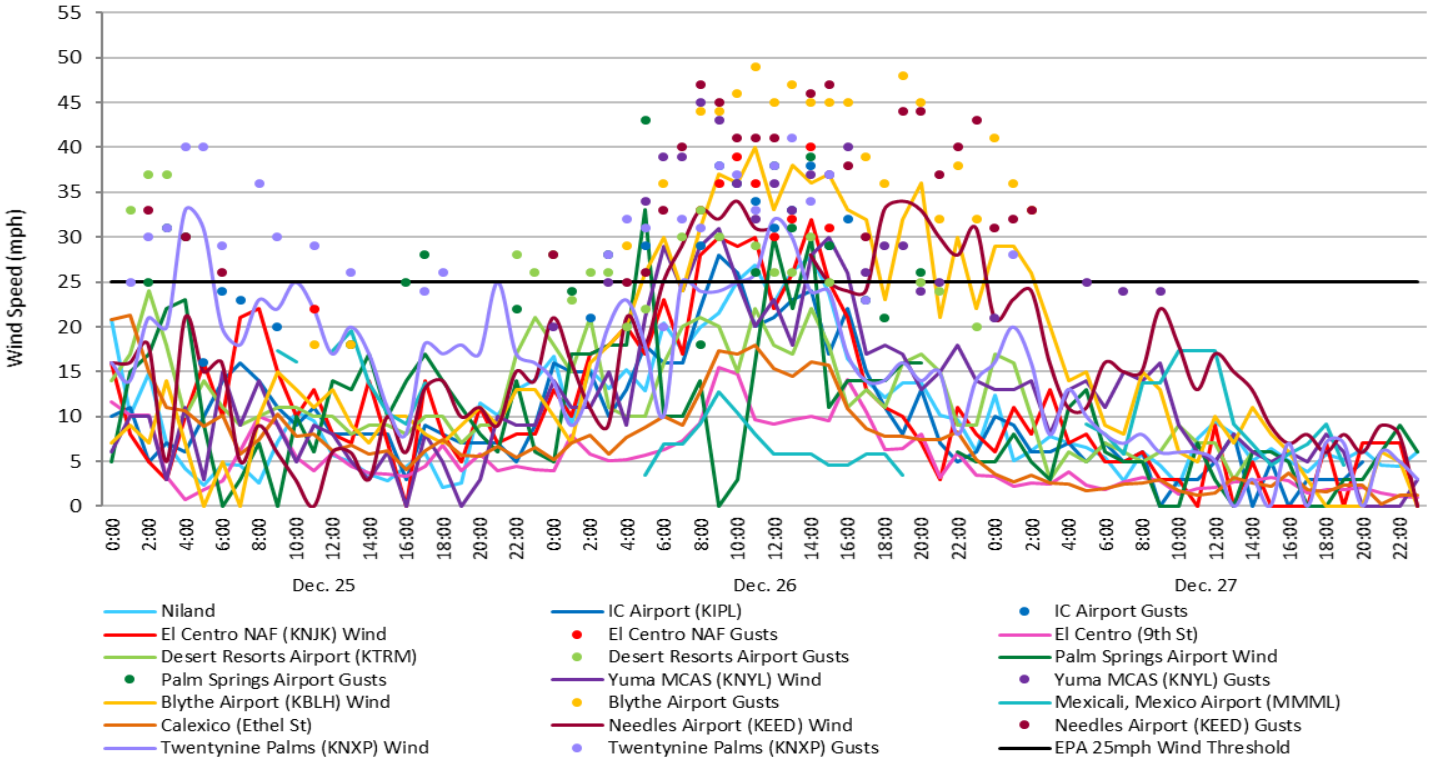


Fig 2-26: Winds speeds measured at regional airports and AQS monitoring stations in Imperial County show significantly elevated winds at almost all sites. All adjusted to reflect PST. Data from the NCEI's QCLCD system, AQS, and the University of Utah's MesoWest

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Westmorland monitor on December 26, 2015, was compared to non-event and event days demonstrating the variability over several years and seasons. The analysis also provides supporting evidence that there exists a clear causal relationship between the December 26, 2015 high wind event and the exceedance measured at the Westmorland monitor.

Figures 3-1 and 3-2 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Westmorland monitor for the six-year period of January 1, 2010 to December 26, 2015, totaling 515 sampling days. The FEM monitor at Westmorland began operation in July 15, 2015 which accounts for the low number of sampling days. In order to properly establish the variability of the event as it occurred on December 26, 2015, 24-hour averaged PM_{10} concentrations between January 1, 2010 to December 26, 2015 were compiled and plotted as a time series. All four figures illustrate that the exceedance, which occurred on December 26, 2015, was outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

FIGURE 3-1
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO DECEMBER 26, 2015

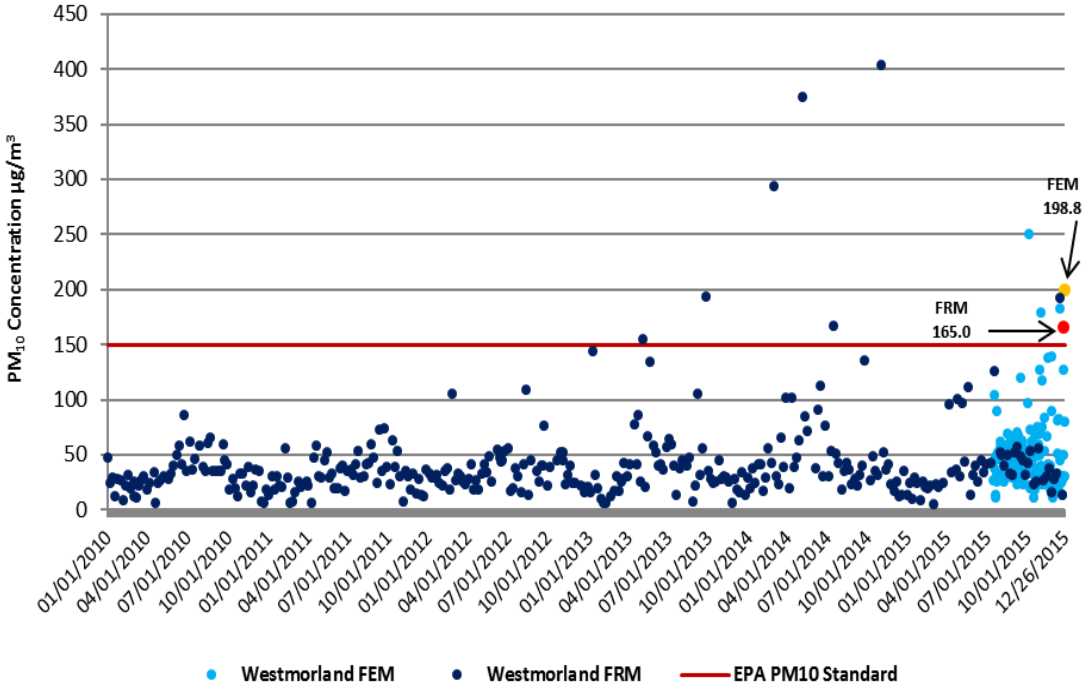
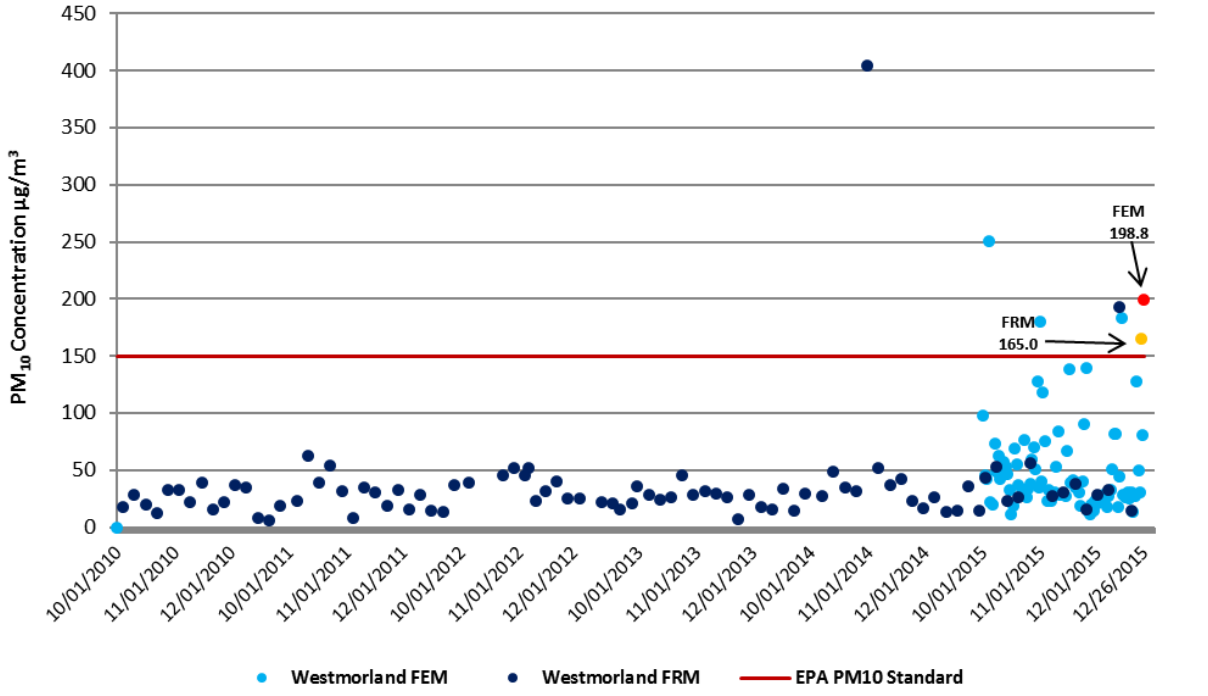


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 165 µg/m^3 and 198 µg/m^3 on December 26, 2015 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 522 credible samples measured within 515 sampling days the Westmorland monitor measured 10 exceedance days, which equates to a less than a 1% occurrence rate

The time series, **Figure 3-1** for Westmorland provides historical concentration to concentration analysis for the monitor. The Westmorland monitor measured 522 credible samples within 515 sampling days (January 1, 2010 and December 26, 2015).

Overall, the time series illustrates that of the 515 sampling days there were 10 exceedance days, which is less than a 1% occurrence rate. Of the total 10 exceedance days, five measured exceedances were measured during the 4th quarter (October through December). The remaining five exceedance days occurred during the first, second and third quarters. The December 26, 2015 concentration was outside the normal historical measurements for the fourth quarter when compared to event days and non-event days. No exceedances of the standard occurred during 2010. As mentioned above FEM BAM data was not considered regulatory from 2010 to 2012.

FIGURE 3-2
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
***OCTOBER 1, 2010 THROUGH DECEMBER 26 2015**



***Quarterly: October 1, 2010 through December 31, 2014 and October 1, 2015 through December 26, 2015**

Fig 3-2: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentrations of 165 µg/m^3 and 198 µg/m^3 on December 26, 2015 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days. Of the 177 credible samples measured within 166 sampling days the Westmorland monitor measured five (5) exceedance days, which equates to a less than a 1 % occurrence rate

Figure 3-2 displays the seasonal fluctuations over 166 sampling days at the Westmorland monitor for months October through December of the years 2010 through 2015 (2015 ending December 26). The seasonal sampling period for Westmorland reflects 177 measured credible samples within 166 sampling days and five (5) exceedance days.[15] This equates to less than one (1) percent of all credible samples.

[15] FEM sampling at the Westmorland site began July 15, 2015

FIGURE 3-3
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO DECEMBER 26, 2015

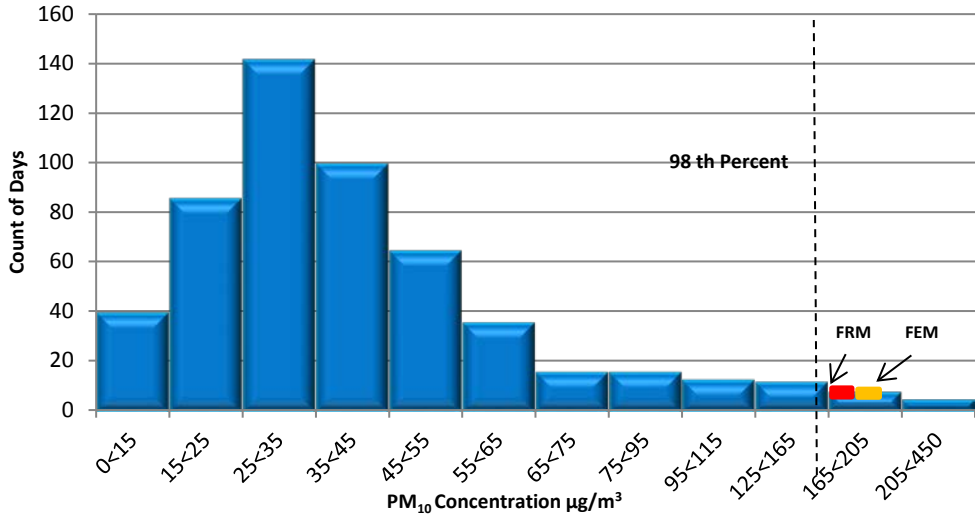
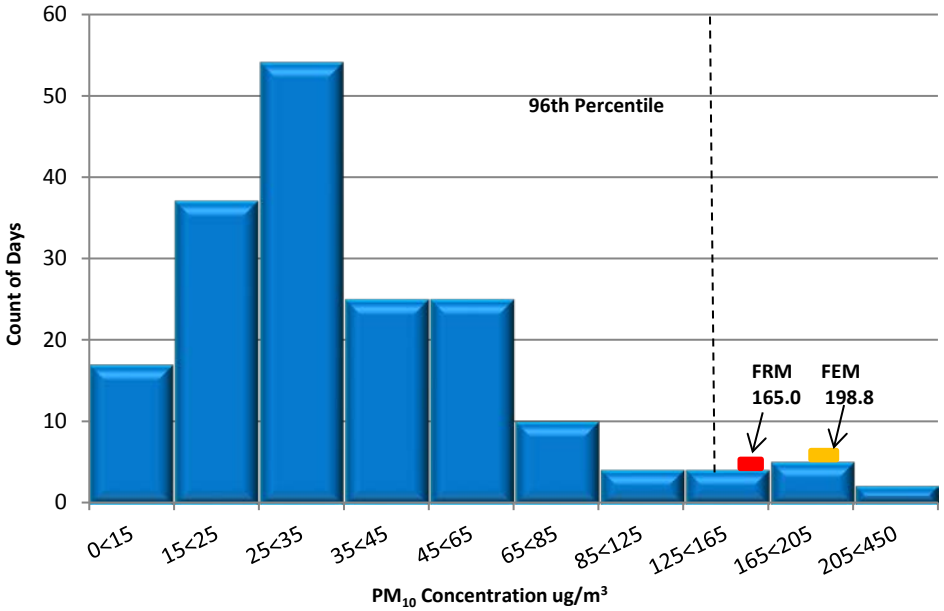


Fig 3-3: The 24-hr average PM_{10} concentration at the Westmorland monitor demonstrates that the concentrations of 165 µg/m^3 and 198 µg/m^3 all fall above the 98th percentile

FIGURE 3-4
WESTMORLAND SEASONAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
***OCTOBER 1, 2010 THROUGH DECEMBER 26, 2015**



***Quarterly: October 1, 2010 through December 31, 2014 and October 1, 2015 through December 26, 2015**

Fig 3-4: The 24-hr average PM_{10} concentration at the Westmorland monitor demonstrates that the December 26, 2015 event was in excess of the 96th percentile

For the combined FRM and FEM data sets the annual historical and the seasonal historical PM_{10} concentrations of 165 µg/m^3 and 198 µg/m^3 for Westmorland are all above the 96th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations and the percentile rankings for both the historical and seasonal patterns the December 26, 2015 measured exceedance is clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plot, seasonal time series plot and the percentile ranking illustrate that the PM_{10} concentrations observed on December 26, 2015 occur infrequently. When comparing the measured PM_{10} levels on December 26, 2015 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedance at the Westmorland site was outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the December 26, 2015 natural event affected the concentrations levels at the Westmorland monitor causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedance on December 26, 2015 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. To address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures to consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for December 26, 2015. In addition, this December 26, 2015 demonstration provides technical and non-technical evidence that strong gusty northerly winds blew across the mountains and deserts within southeastern California and Arizona and into Imperial County suspending particulate matter affecting the Westmorland monitors on December 26, 2015. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the December 26, 2015 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25,

1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

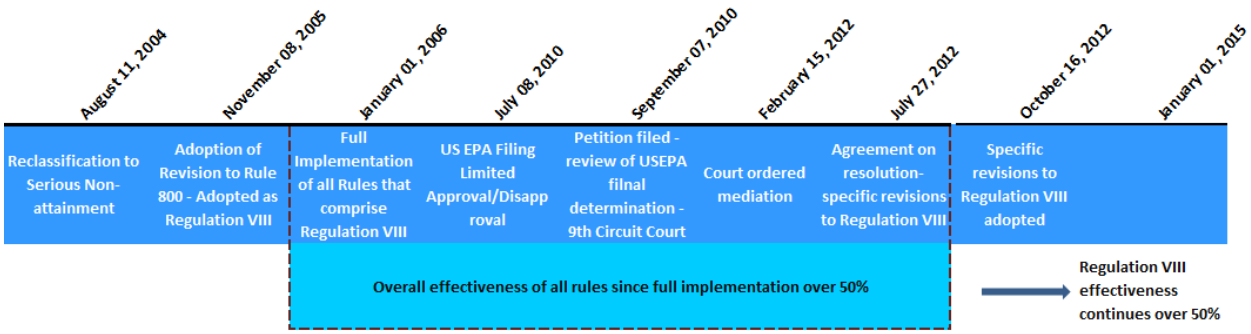


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

Below is a brief summary of Regulation VIII, which is comprised of seven fugitive dust rules. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B of Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generate dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California, which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews hourly surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four-quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On December 26, 2015, the ICAPCD declared a No Burn day **(Appendix A).** No complaints were filed for agricultural burning on December 26, 2015.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland, Niland, and Brawley during the January 31, 2016 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express,

and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. No complaints were filed on December 26, 2015 related to agricultural or waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

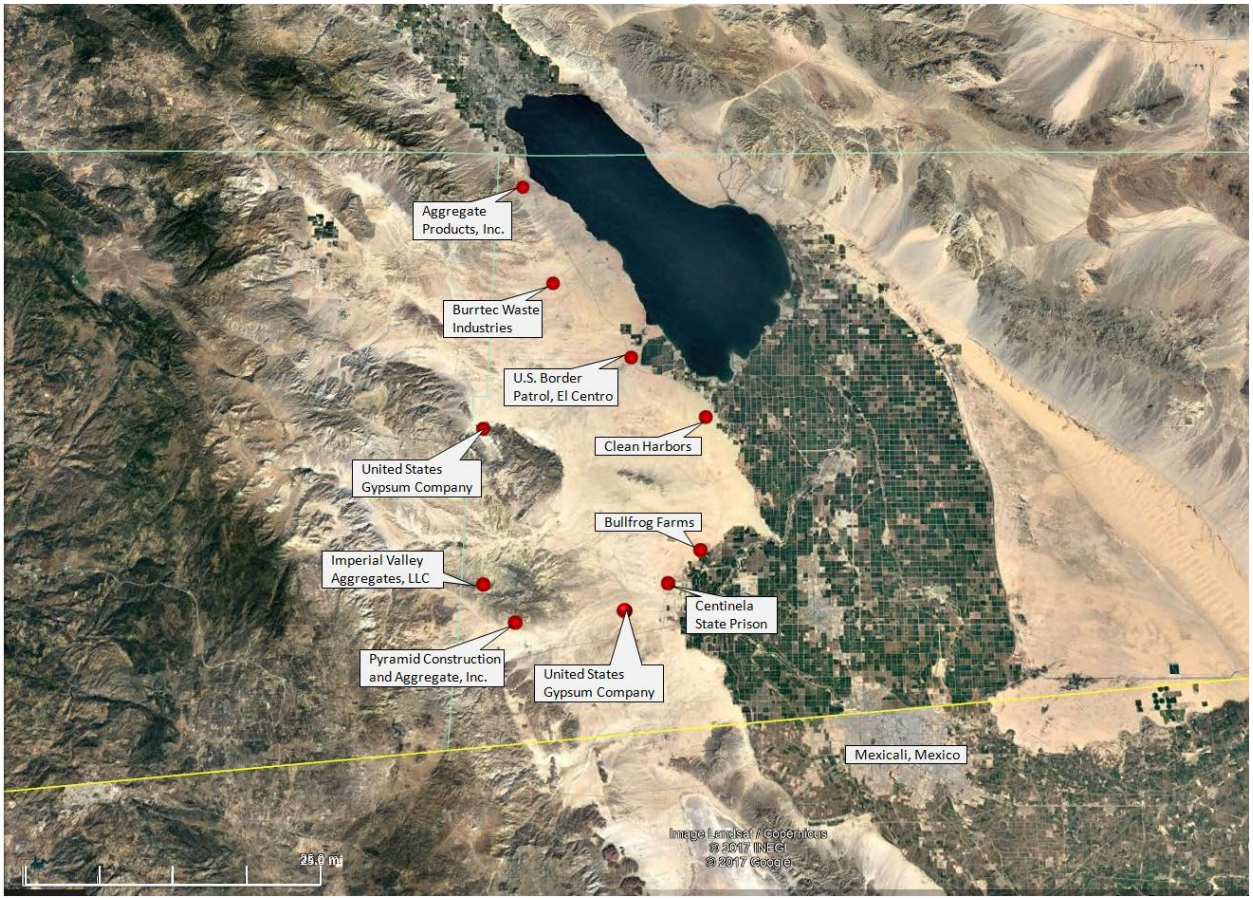


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Westmorland monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

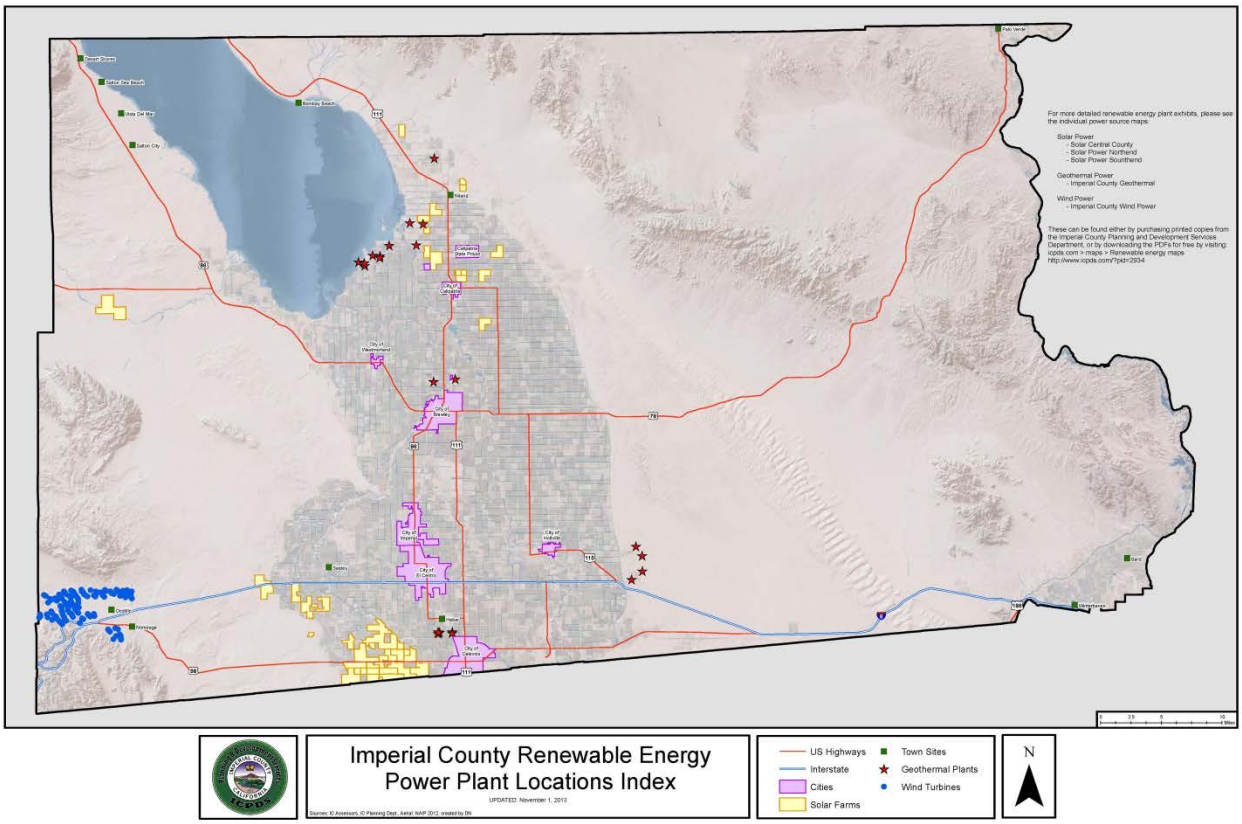


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Westmorland monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

As discussed in section I and II the ICAPCD published the National Weather Service (NWS) extended Holiday forecast synopsis from the San Diego and Phoenix offices. The ICAPCD published notice described two weather systems; the first system expected to affect the region through Christmas Eve, bringing strong and gusty winds along with rain and snow through the San Diego Mountains and deserts. The second system expected to affect the region through Saturday December 26, 2015, would bring cold air and gusty northerly winds accompanied by blowing dust. In all, the San Diego NWS office issued six Urgent Weather Messages containing High Wind Advisories and Frost Advisories. The Phoenix NWS office issued five Urgent Weather Messages that contained Wind Advisories, which included Imperial County as an impact area. All the advisories forecasted north winds up to 35 mph with gust up to 45 mph and reduced visibility due to blowing dust.

In addition, an AQI alert was issued by the ICAPCD. The web based AQI alert by the ICAPCD on December 26, 2015 advised of high levels of suspended particulate matter and the associated health risk. **Appendix A** contains copies of pertinent notice to the December 26, 2015 event.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County. Imperial County Airport (KIPL) measured elevated winds up to 28 mph as well as gusts up to 38 mph. The El Centro NAF measured winds up to 32 mph, with wind gusts up to 40 mph (see **Table 2-2**). Meteorological sites to the north and northeast of Imperial County, such as the Blythe Airport (KBLH), measured 15 hours of winds at or above 25 mph. KBLH measured 40 mph peak winds. KBLH had 11 hours of gusts at or above 40 mph, with a peak gust of 49 mph. Wind speeds over 25 mph are normally sufficient to overcome most PM_{10} control measures. Although located downstream, local airports measured winds at or above 25 mph. During the December 26, 2015, event wind speeds continued above the 25 mph threshold overcoming the BACM in place, particularly in Westmorland.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that a secondary low-pressure system and secondary frontal boundary moved through the region Saturday, December 26, 2015 bringing cooler temperatures and very windy conditions. The north winds aloft behind the low pressure and strong cold surface high pressure over the Great Basin created strong gusty north to northeast winds along and below mountain slopes and deserts causing uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event.[16] These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements in the Westmorland and surrounding areas to the north and south of Westmorland during the event were high enough (at or above 25 mph, with wind gusts at 49 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on December 26, 2015 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedance and the high wind event timeline and geographic location. The December 26, 2015 event considered an exceptional event under the requirements of the exceptional event rule.

[16] Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Federal Register, 78 FR 23677, April 22, 2013 with an effective date of May 22, 2013.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for December 26, 2015, identified a low-pressure system and secondary frontal boundary that moved through the region Saturday, December 26, 2015 bringing cooler temperatures and very windy conditions. The north winds aloft behind the low pressure and strong cold surface high pressure over the Great Basin created strong gusty north to northeast winds along and below mountain slopes and deserts with the strongest winds during the afternoon hours of December 26, 2015.

The San Diego NWS office described an impressive mid latitude cyclone over the west coast with the center of the low-pressure near Portland as early as 1347 PST December 24, 2015. The associated cold front described as sagging along the Central California moved across southern California the evening of Christmas Eve and Christmas morning causing light snow showers across the northern mountains and patchy frost in the valleys.[17] This is significant because discussions in area forecasts prior to the development of a strong surface high-pressure revealed low levels of moisture allowing for isolated showers across the higher terrain of Central Arizona. As the cold front moved inland moisture levels, whether rain or snow, increased within the mountain and open desert areas within Riverside County and Arizona. This provided conditions conducive to less saltation, less suspended windblown dust thus less deposition. However, the winds were not only strong enough but were enduring through most of the day to overcome any naturally occurring saturation and did transport sufficient amounts of particulates to elevate particulate matter within Imperial County ultimately affecting air quality.

By December 26, 2015, a strong ridge of high-pressure over the Pacific began to move onshore prompting the development of a strong cold surface high-pressure over the Great Basin bringing strong gusty north to northeast winds along southeast California and southwest Arizona.

Entrained windblown dust from natural areas, particularly from the desert area and anthropogenic sources controlled with BACM, is verified by the meteorological and air quality observations on December 26, 2015. Meteorological data show that these strong and gusty northerly winds blew across the deserts outside of Imperial County were directly responsible for the high PM_{10} concentrations observed in Imperial County on December 26, 2015.

Figure 5-1 is an Aqua MODIS satellite image of blowing dust in Imperial County. The transported windblown dust affected air quality in Imperial County and caused a measured exceedance at the Westmorland monitor when BACM in place was overwhelmed by the long enduring and strong northerly winds.

[17] Area Forecast Discussion National Weather Service San Diego CA 915 PM PST Thursday December 24, 2015 and 305 AM PST; 830 AM PST; 926 PM PST and Phoenix 144 PM PST 244 PM MST Friday, December 25, 2015

FIGURE 5-1
VISIBLE DUST IN IMPERIAL COUNTY

Fig 5-1: A Terra MODIS satellite image (~1030 PST) captured on December 26, 2015, identifies windblown transported dust from natural areas to the northeast of Imperial County. Source: MODIS Today

Figures 5-2 through 5-5 are Aerosol Optical Depth (AOD) images using the Deep Blue layer captured by the MODIS instrument onboard the Terra and Aqua satellites.[18] **Figures 5-3** and **Figure 5-5** are images utilizing the Deep Blue Angstrom Exponent layer[19] discriminating between aerosol particle sizes. The images, captured at 1030 and at 1300 PST, identify deep layers of particles over Imperial County for a good portion of the day.

[18] **Aerosol Optical Depth (AOD**) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov **The Deep Blue Aerosol Optical Depth** layer is useful for studying aerosol optical depth over land surfaces. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths) where Dark Target approaches fail

[19] The MODIS **Deep Blue Aerosol Ångström Exponent** layer can be used to provide additional information on the aerosol particle size over ocean. This layer is created from the Dark Target (DT) algorithm that retrieves over ocean (dark in visible and longer wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke).

FIGURE 5-2
HEAVY AEROSOLS CAPTURED OVER IMPERIAL COUNTY TERRA SATELLITE

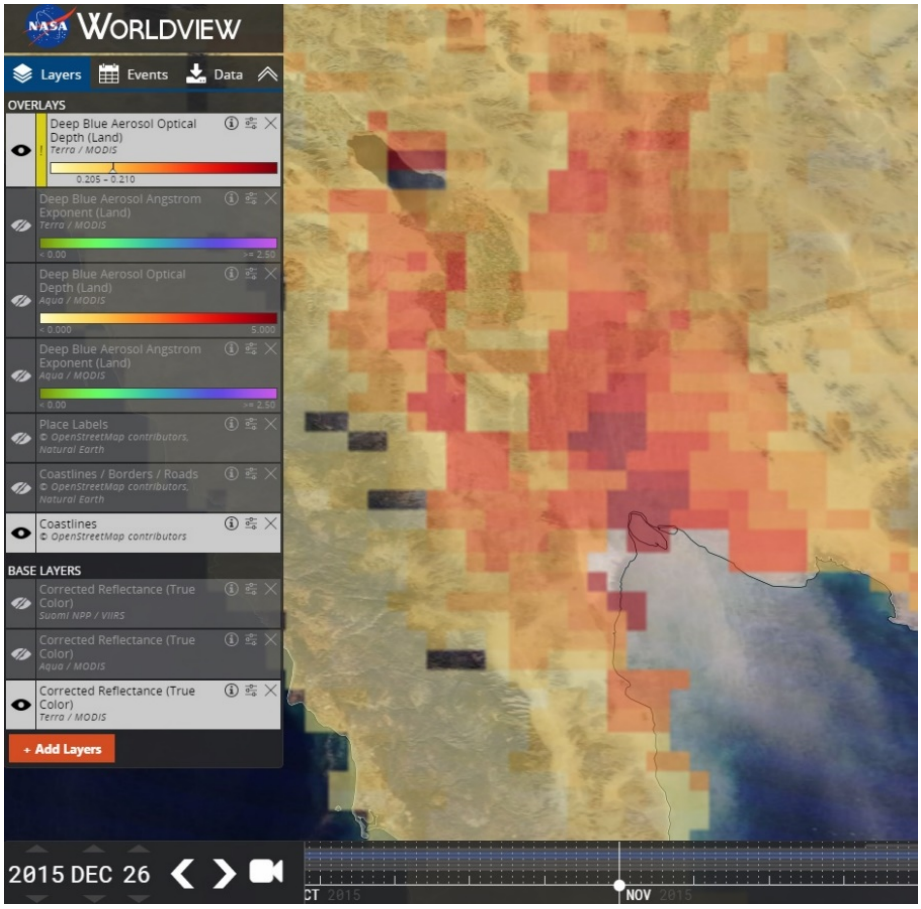


Fig 5-2: The MODIS instrument onboard the Terra satellite captured heavy layers of aerosols just north above the Salton Sea on December 26, 2015 at 1030 PST. Warmer color indicate thicker layers of aerosols. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

FIGURE 5-3
DUST LIKE AEROSOLS CAPTURED OVER IMPERIAL COUNTY TERRA SATELLITE

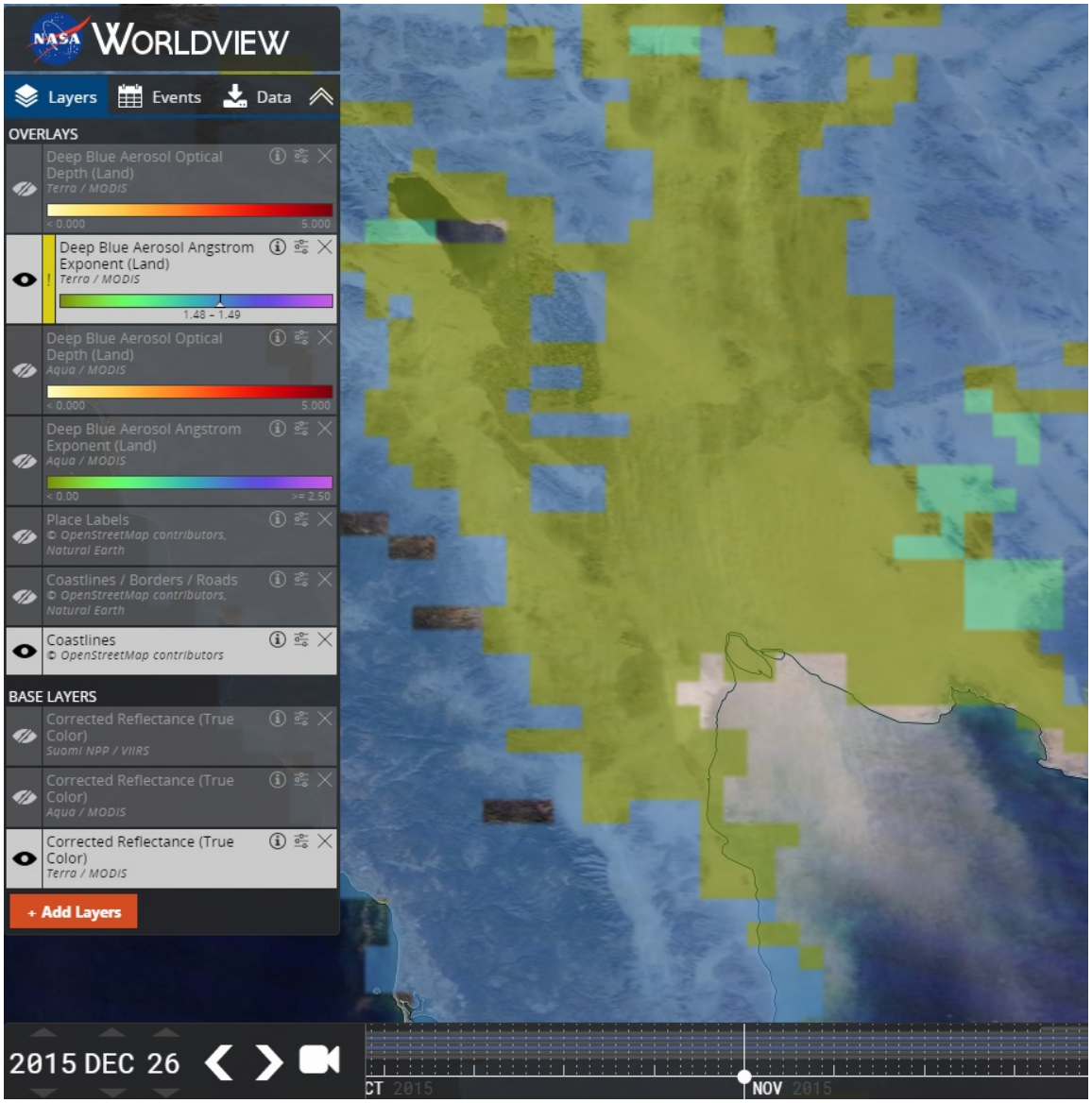


Fig 5-3: This image is identical to the above except that it utilizes the Deep Blue Angstrom Exponent layer. Green areas indicate larger aerosol particles that have a greater likelihood of being dust. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

FIGURE 5-4
HEAVY AEROSOLS CAPTURED OVER IMPERIAL COUNTY AQUA SATELLITE

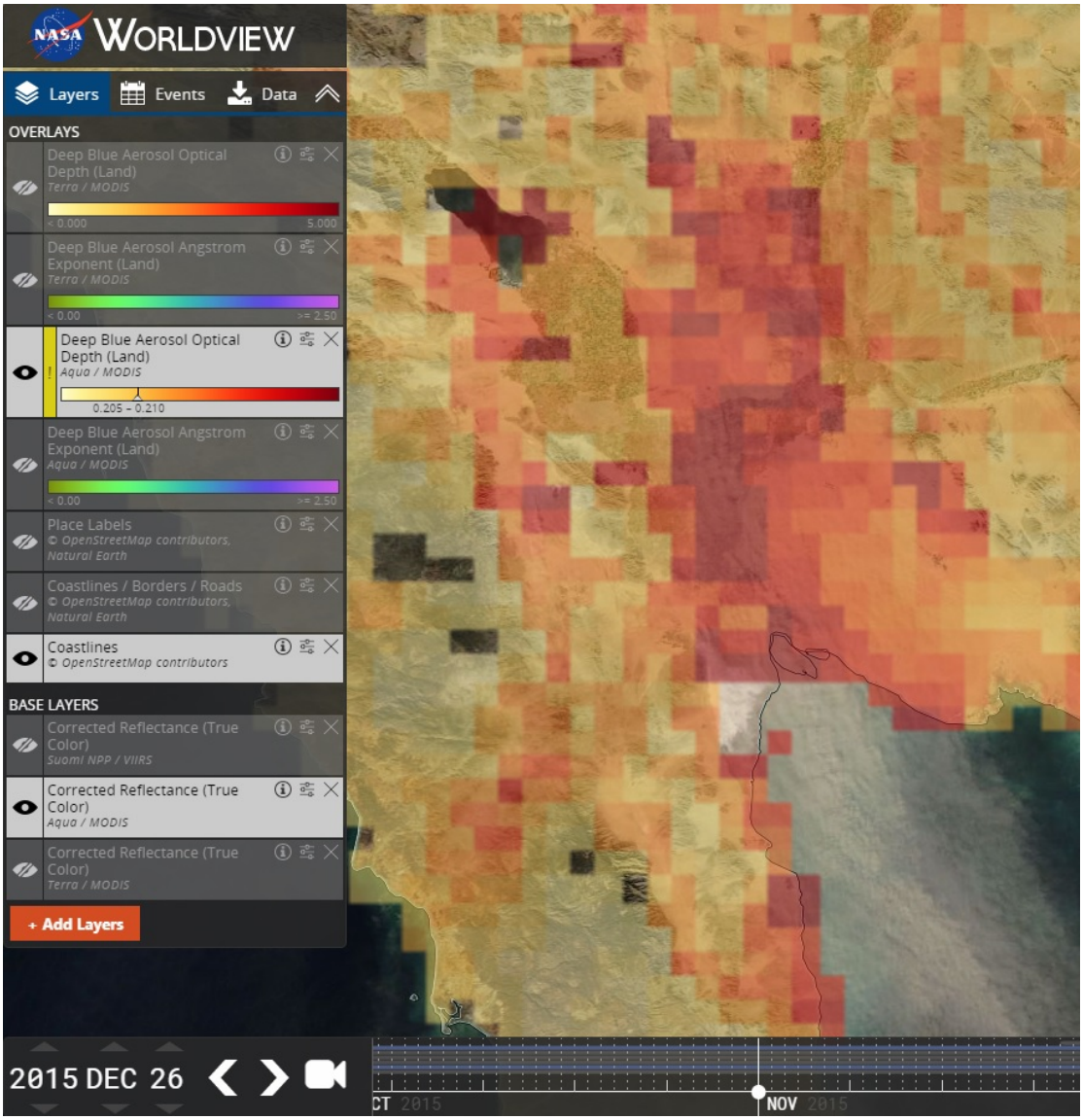


Fig 5-4: The MODIS instrument onboard the Aqua satellite captured heavy layers of aerosols just north above the Salton Sea on December 26, 2015 at 1330 PST. Warmer color indicate thicket layers of aerosols. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

FIGURE 5-5
DUST LIKE AEROSOLS CAPTURED OVER IMPERIAL COUNTY AQUA SATELLITE

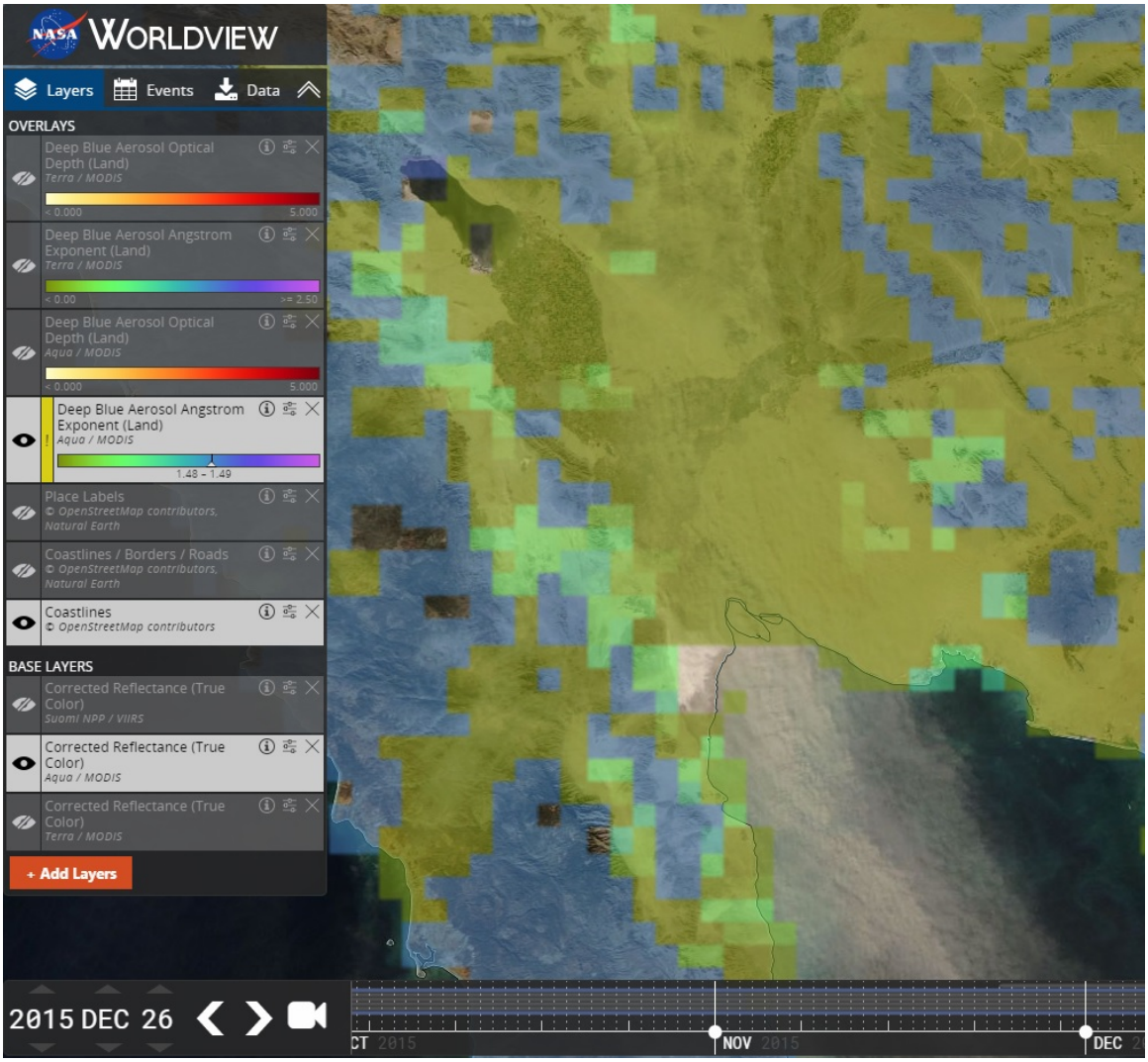


Fig 5-5: This image is identical to the above except that it utilizes the Deep Blue Angstrom Exponent layer. Green areas indicate larger aerosol particles that have a greater likelihood of being dust. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

The Smoke Text Product (**Figure 5-6**) issued by NOAA's Satellite Services Division supports the observation of the heavy aerosols by the AOD. The Smoke Text Product identified blowing dust resulting from strong northerly winds originating from source regions over southern and southeastern California, southwestern and western Arizona and northwestern Mexico (Baja California and Sonora). Of note, is the identification of dust appearing "thin" in density around the edges. As winds endure through the day, naturally moist areas dry whereby greater amounts of suspended particles are carried south towards Imperial County allowing for intermittent measured concentrations at the Niland and Brawley monitors. In Westmorland, the area immediately surrounding the monitor to the northeast has an exposed but controlled with BACM open area. The duration of the winds combined with the strength of the winds, at or above 25

mph overcame BACM in place causing the Westmorland monitor to be the only monitor in Imperial County to exceed the NAAQS.

FIGURE 5-6
OBSERVED BLOWING DUST

BLOWING DUST
Southern California/Southwestern and Western Arizona/Northwestern Mexico:
Strong northerly winds were responsible for an area of blowing dust which began prior to sunrise(1500Z) and continued through the day spreading to the south. The dust originated from a number of source regions over southern and southeastern California, southwestern and western Arizona, and northwestern Mexico including the area just north of the Gulf of California. The surrounding edges of the dust appeared to be thin in density though some embedded moderately dense to even locally dense dust was visible especially moving south over southeastern California, far southwestern Arizona, and far northwestern Mexico and over the northern part of the Gulf of California.

Fig 5-6: Is a section of the issued Smoke Text Product identifying Blowing Dust originating from source regions over southern and southeastern California, southwestern and western Arizona and northwestern Mexico. **Appendix A** contains the entire Smoke Text Product. TSource: http://www.ssd.noaa.gov/PS/FIRE/DATA/SMOKE/2015/2015L270325.html

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[20] **Tables 5-1 and 5-2** provide a temporal relationship of upstream wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at Westmorland on December 26, 2015. The tables show that peak hourly concentrations took place immediately following or during the period of high upstream wind speeds. The El Centro NAF, located southwest of the Westmorland monitor, is included to illustrate the level of impact to the region, including the observations of blowing dust to help substantiate that blowing dust occurred and that blowing dust travelled south. Although not included in the table below the Blythe Airport (KBLH), located upstream of the Westmorland monitor, reports 12 hours of hazy conditions with reduced visibility below 0.5 Statute Miles at times. **Appendix B** contains copies of the Quality Controlled Local Climatological Data (QCLCD) reports identifying measured wind speeds, direction and levels of visibility.

[20] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-1
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND DECEMBER 26, 2015

Bombay Beach				Blythe Airport (KBLH)				El Centro NAF (KNJK)					Westmorland				Westmorland	
HR	W/S	W/G	W/D	HR	W/S	W/G	W/D	HR	W/S	W/G	W/D	Obs.	HR	W/S	W/G	W/D	HR	PM_{10} (µg/m³)
0	19		337	52	10		350	56	13		340		0	9.3		341	0	7
100	20		337	152	7		340	156	10		340		100	11		345	100	12
200	19		333	252	16		10	256	17		340		200	12		342	200	16
300	20		330	352	18		350	356	18		330		300	12		336	300	113
400	14		344	452	20	29	350	456	20		320		400	12		346	400	46
500	16		312	552	26		350	556	17		310		500	13		339	500	42
600	20		356	652	30	36	340	656	23		320		600	14		334	600	60
700	22		349	752	24		350	756	17		330		700	15		343	700	230
800	28		340	852	31	44	350	856	28	33	340	HZ	800	16		348	800	257
900	29		345	952	37	44	360	956	30	36	350	BLDU	900	19		355	900	346
1000	30		354	1052	36	46	360	1056	29	39	340		1000	18		348	1000	742
1100	23		4	1140	40	49	360	1156	30	36	340		1100	18		343	1100	593
1200	22		360	1252	33	45	350	1256	22	30	350		1200	17		345	1200	459
1300	26		357	1352	38	47	360	1356	26	32	330		1300	18		345	1300	295
1400	25		0	1455	36	45	360	1456	32	40	350	BLDU	1400	18		343	1400	429
1500	23		351	1520	37	45	360	1556	25	31	340	BLDU	1500	18		343	1500	395
1600	20		345	1610	33	45	350	1656	21		350	BLDU	1600	16		344	1600	368
1700	17		325	1752	32	39	350	1756	13		340	BLDU	1700	14		347	1700	109
1800	22		334	1852	23	36	350	1856	11		340	BLDU	1800	12		347	1800	77
1900	25		337	1929	32	48	360	1956	10		340	BLDUs	1900	13		351	1900	49
2000	18		346	2004	36	45	350	2056	7		220	BLDUs	2000	8.1		346	2000	65
2100	21		341	2152	21	32	350	2156	3		240	BLDUs	2100	11		346	2100	34
2200	24		339	2252	30	38	350	2256	11		350	BLDU	2200	8.3		355	2200	14
2300	17		0	2352	22	32	350	2356	8		290	BLDUs	2300	3.5		339	2300	13

*Wind data for KNJK and KBLH from the NCEI's QCLCD system. Wind data for Bombay Beach from AQMIS2. Westmorland wind and air quality data from the EPA's AQS. Westmorland station does not record wind gusts. Wind speeds = mph; Direction = degrees; BLDU = blowing dust; s = suspect value

TABLE 5-2
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND DECEMBER 26, 2015

Needles Airport (KEED)				Twentynine Palms Airfield (KNXP)				Desert Center (EW7734_				Niland				Westmorland	
HR	W/S	W/G	W/D	HR	W/S	W/G	W/D	HR	W/S	W/G	W/D	HR	W/S	W/G	W/D	HR	PM_{10} ($\mu g/m^3$)
56	21	28	10	56	14		290	058	3	9	338	0	17		351	0	7
156	16		30	156	9		300	158	5	11	309	100	9.1		336	100	12
256	11		10	256	13		340	258	3	12	287	200	15		343	200	16
356	9		10	356	20	28	340	357	4	8	294	300	13		333	300	113
456	21	25	10	456	23	32	320	457	0	1		400	15		326	400	46
556	18	26	360	556	18	31	310	559	2	6	319	500	13		329	500	42
656	25	33	10	656	10	20	100	658	5	13	306	600	20		344	600	60
756	29	40	10	756	25	32	330	758	7	21	342	700	17		352	700	230
856	33	47	20	856	24	31	340	858	15	25	297	800	20		332	800	257
942	32	45	20	956	24	38	340	959	11	19	323	900	22		344	900	346
1056	34	41	20	1056	25	37	340	1059	10	25	318	1000	25		354	1000	742
1156	31	41	20	1156	26	33	340	1159	15	26	331	1100	27		359	1100	593
1256	31	41	10	1256	32	38	330	1245	16	26	304	1200	23		345	1200	459
1356				1356	30	41	330	1345	15	28	309	1300	26		347	1300	295
1456	28	46	20	1456	24	34	350	1400	15	25	270	1400	28		1	1400	429
1556	25	47	20	1556	24	37	340	1500	12	33	320	1500	24		346	1500	395
1606	24	38	20	1656	17		330	1600	9	25	288	1600	17		339	1600	368
1756	24	30	20	1756	14	23	330	1700	11	23	337	1700	14		332	1700	109
1856	33		30	1856	14		310	1816	7	13	309	1800	12		339	1800	77
1956	34	44	20	1956	16		310	1901	14	25	318	1900	14		334	1900	49
2056	33	44	20	2056	14		330	2001	5	14	328	2000	14		349	2000	65
2119	30	37	20	2156	15		310	2101	11	20	325	2100	10		341	2100	34
2256	28	40	20	2256	8		310	2202	2	13	325	2200	9.6		334	2200	14
2356	31	43	10	2356	14		310	2302	1	6	157	2300	6.1		320	2300	13

*Wind data for KEED and KNXP from the NCEI's QCLCD system. Wind data for Desert Center (EW7734) from the University of Utah's MesoWest. Westmorland air quality data from the EPA's AQS. Niland (English Rd) wind data from the EPA's AQS. station does not record wind gusts. Wind speeds = mph; Direction = degrees

As discussed above north winds aloft behind the low-pressure system and strong cold surface high pressure over the Great Basin created strong gusty north to northeast winds along and below mountain slopes and deserts with the strongest winds during the afternoon hours of December 26, 2015. This combination, the low-pressure and strong cold surface high-pressure developed after the passing of an impressive mid latitude cyclone that quickly passed over the region the evening of Christmas Eve and Christmas morning causing light snow showers across the northern mountains and patchy frost in the valleys. Moisture levels, not considered significant were sufficient to created conditions conducive to less saltation thus less deposition Christmas Eve and Christmas day. Winds, however, were not only strong enough, Christmas Eve

and Christmas day, but were sufficiently enduring to overcome naturally occurring saturation allowing for the transport of sufficient amounts of windblown dust into Imperial County by December 26, 2015.

Bombay Beach directly northeast of Westmorland, measured multiple consecutive hours of winds equal to or above 25mph. Haze or blowing dust observed at the Blythe Airport (KBLH), Imperial County Airport (KIPL) and the El Centro NAF (KNJK) all attest to reduced visibility that supports an effect upon air quality. **Appendix B** contains copies of QCLCD reports.

As north northeast winds blew over natural open desert areas suspended windblown dust reached monitors as early as 0300 PST. The strongest winds occurred during the afternoon to evening hours December 26, 2015 coincident with elevated concentrations at monitors. Although elevated winds transported windblown dust into Imperial County moist low levels that existed Christmas Eve and Christmas, within the north, northeastern areas around Imperial County allowed for less saltation of particles and less deposition onto the air monitors causing intermittent elevated concentrations at the Niland, Brawley and El Centro monitors during the early morning hours. However, as the strong gusty northerly winds continued through the day naturally moisture areas dried and succumbed to saltation and suspension allowing for measured elevated concentrations during the afternoon hours of December 26, 2015. At the Westmorland monitor, the same occurred with one significant difference. Unlike the Niland, Brawley or El Centro monitors, the area directly to the northeast of the Westmorland monitor is as an open area owned by the City of Westmorland. BACM measures include daily watering and fencing to restrict vehicle access and speeds. On December 26, 2015, the strong, gusty and long enduring northerly winds overwhelmed the BACM in place at the Westmorland monitor affecting air quality and causing an exceedance.

FIGURE 5-7
WESTMORLAND MONITOR

Fig 5-7: Panoramic view of the Westmorland station in a generally west direction. To the right is the southwest, in the middle is west and the right is northwest. The northeastern portion includes water ponds and an entrance to the site that is unpaved. The El Centro and Brawley monitors are located within the middle of an urban setting on government building rooftops. The Niland monitor surrounded by open agricultural lands to the south and vacant vegetated private property to the east, north and west is located within the far eastern portion of Imperial County

FIGURE 5-8
EXCEEDANCE FACTORS

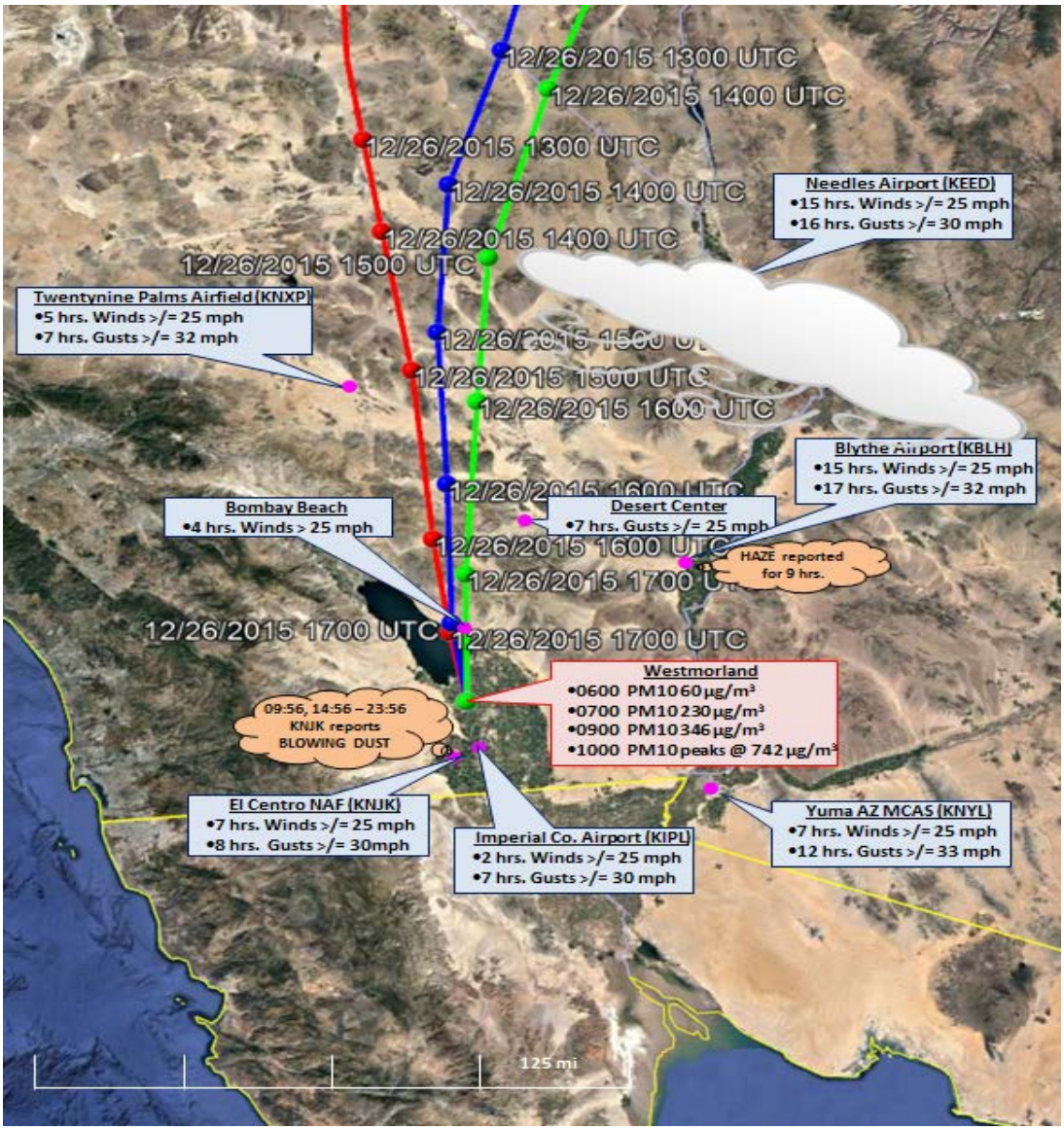


Fig 5-8: A 10-hour HYSPLIT back-trajectory ending at 1000 PST on December 26, 2015 depicts the path of the air parcel as it approached Westmorland. Strong, gusty northerly winds that originated within naturally open desert areas to the north of Imperial County transported windblown dust into Imperial County. Yellow line is the international border. Red lines indicate airflow at 10 meters AGL (above ground level); blue lines indicate airflow at 100 meters AGL; and green lines indicate airflow at 500 meters AGL. Dynamically generated through NOAA's Air Resources Laboratory. Base map from Google Earth

Figures 5-9 through 5-13 demonstrates the temporal relationship between the high winds and the transported windblown dust and resulting effect upon air quality in Imperial County. The positive correlation of measured PM_{10} concentrations at air monitors in Imperial County and

specifically at the Westmorland monitor with elevated wind speeds on December 26, 2015 indicate that as wind speeds increased so did concentrations of PM_{10}.

The elevated PM_{10} concentrations occurred mid-morning through the early afternoon hours coincident with measured elevated wind speeds and gusts at different stations in Riverside and Imperial Counties. **Appendix C** contains additional graphs illustrating the relationship between the high PM_{10} concentrations and increased wind speeds from other monitoring sites within Imperial, Riverside, and Yuma counties on December 26, 2015**.**

FIGURE 5-9
WESTMORLAND PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

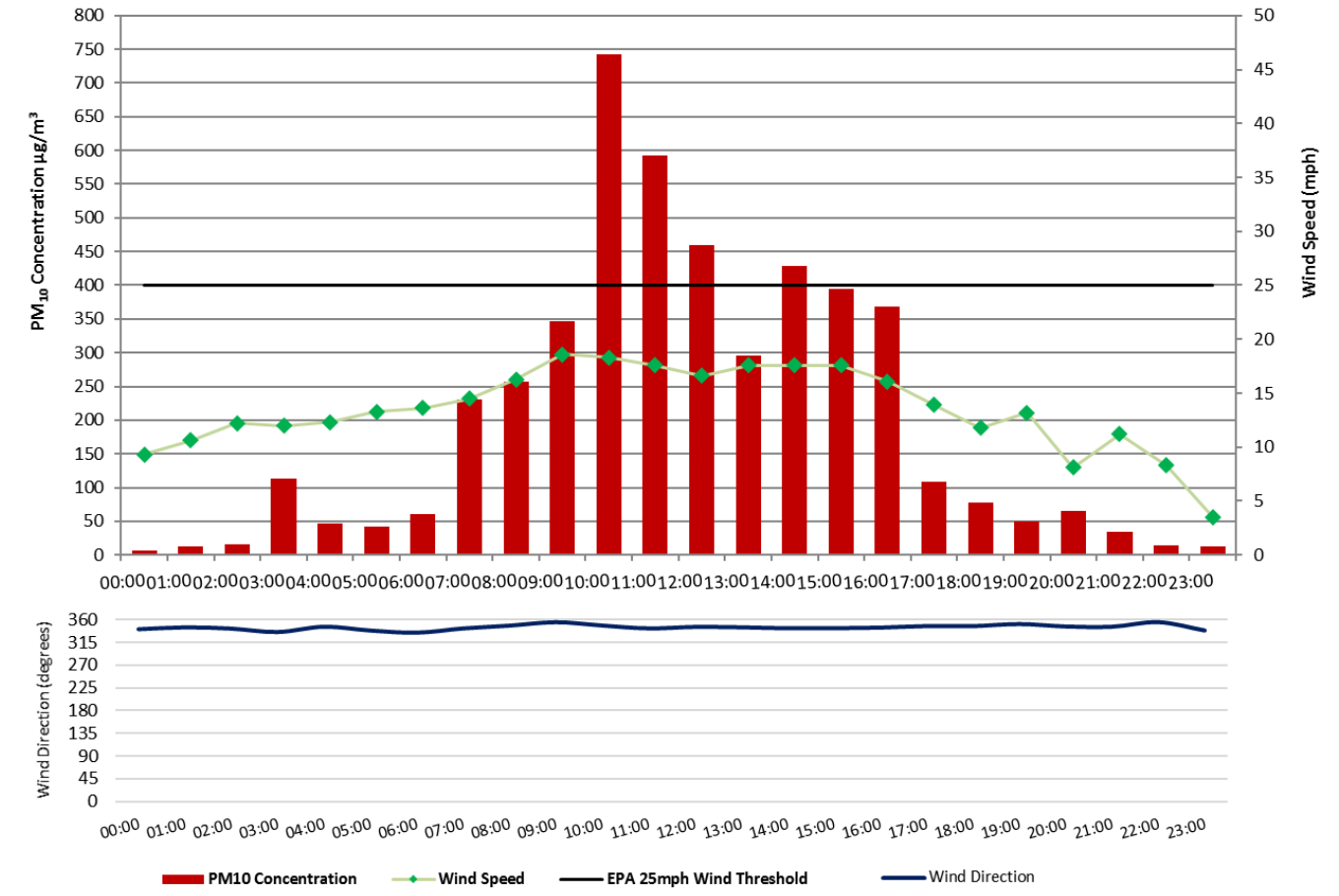


Fig 5-9: Westmorland PM_{10} concentrations show a positive correlation with the high winds and concentrations. Elevated wind speeds continued for over an hour while correlated elevations in PM_{10} concentrations occurred. Wind Direction was from nearly due north the entire day. Westmorland Station air quality and wind data from the EPA's AQS data bank

Figure 5-10 is a three-day depiction, December 25, 2015 through December 27, 2015 of the PM_{10} concentrations for the Westmorland monitor. On December 25, 2015, the Westmorland monitor measures lower level concentrations as winds remain light. However, as winds begin to increase

during the mid-morning concentrations show a similar increase. As winds continued throughout the afternoon, PM_{10} concentrations similarly increased. As winds subsided back to relatively calm conditions during the late afternoon hours so did concentrations.

FIGURE 5-10
WESTMORLAND PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

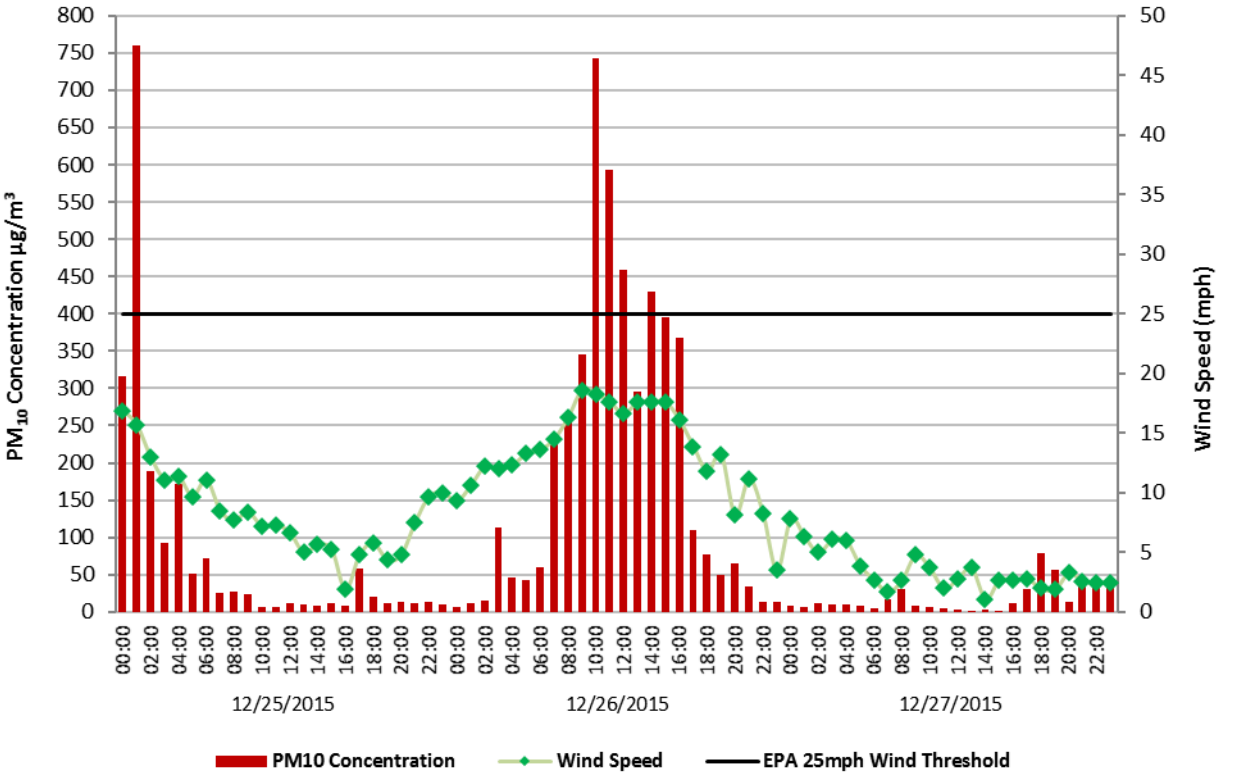


Fig 5-10: This graph illustrates the concentration levels and wind speeds for the day before, day after and December 26, 2015, for the Westmorland monitor. The elevated wind speeds on December 26, 2015 correspond to the elevated concentrations

Figure 5-11 illustrates the correlation of upstream wind speeds to Westmorland hourly PM_{10} fluctuations over a 72-hour period. Elevated winds speeds at upstream sites correspond to elevated levels of PM_{10} at the Westmorland station.

FIGURE 5-11
72 HOUR PM_{10} CONCENTRATIONS AND UPSTREAM WIND SPEEDS

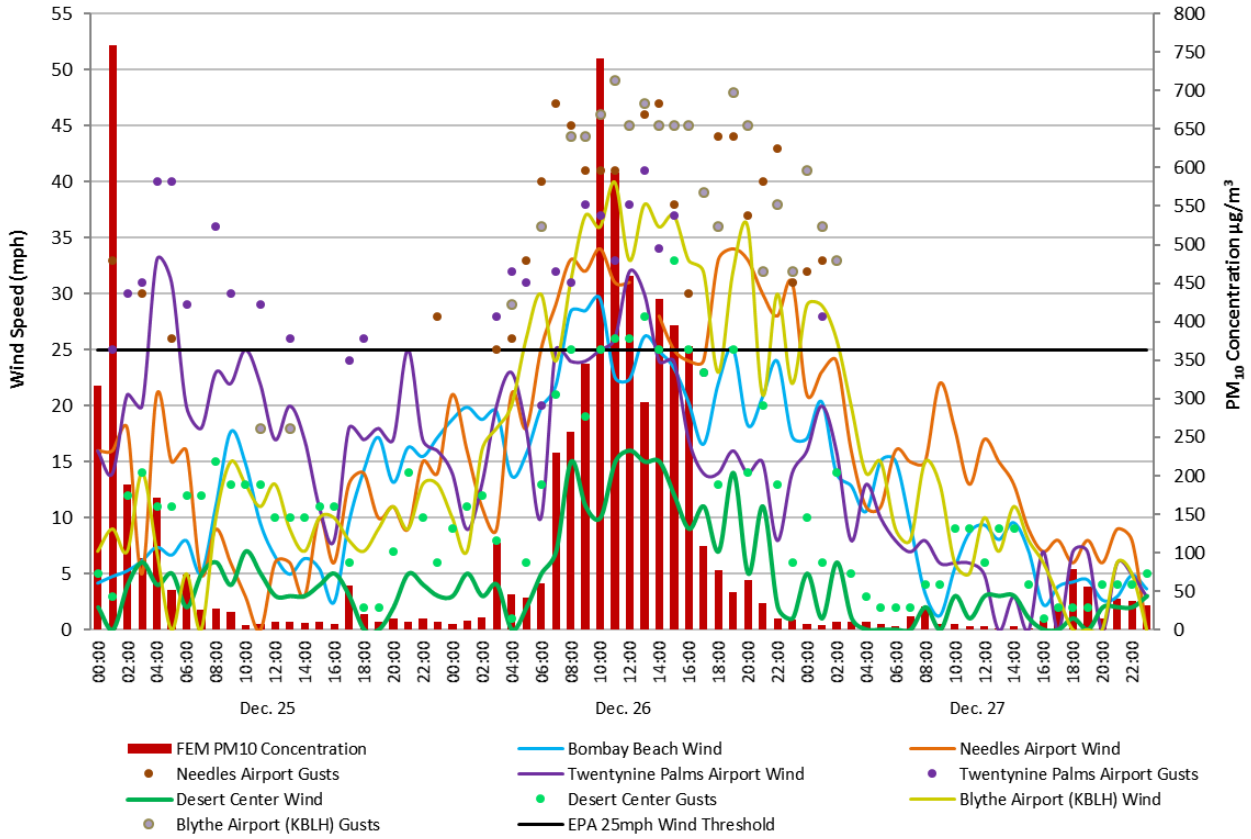


Fig 5-11: A three-day depiction of upstream wind speeds correlated to PM_{10} levels at Westmorland show that as wind speeds and gusts increased so did level of PM_{10} concentrations on December 26, 2015

Figure 5-12 displays observed visibility at El Centro NAF (KNJK), Imperial County Airport (KIPL), and Blythe Airport (KBLH). Air monitors measured elevated concentration of PM_{10} coincident with the observed reduced visibility of just 0.25 miles at 0852 on December 26, 2015 by the Blythe airport. Both KIPL and KNJK reported reduced visibility shortly after Blythe. Reduced visibility caused by blowing dust affected air quality in Imperial County.

FIGURE 5-12
72 HOUR PM_{10} CONCENTRATIONS AND VISIBILITY

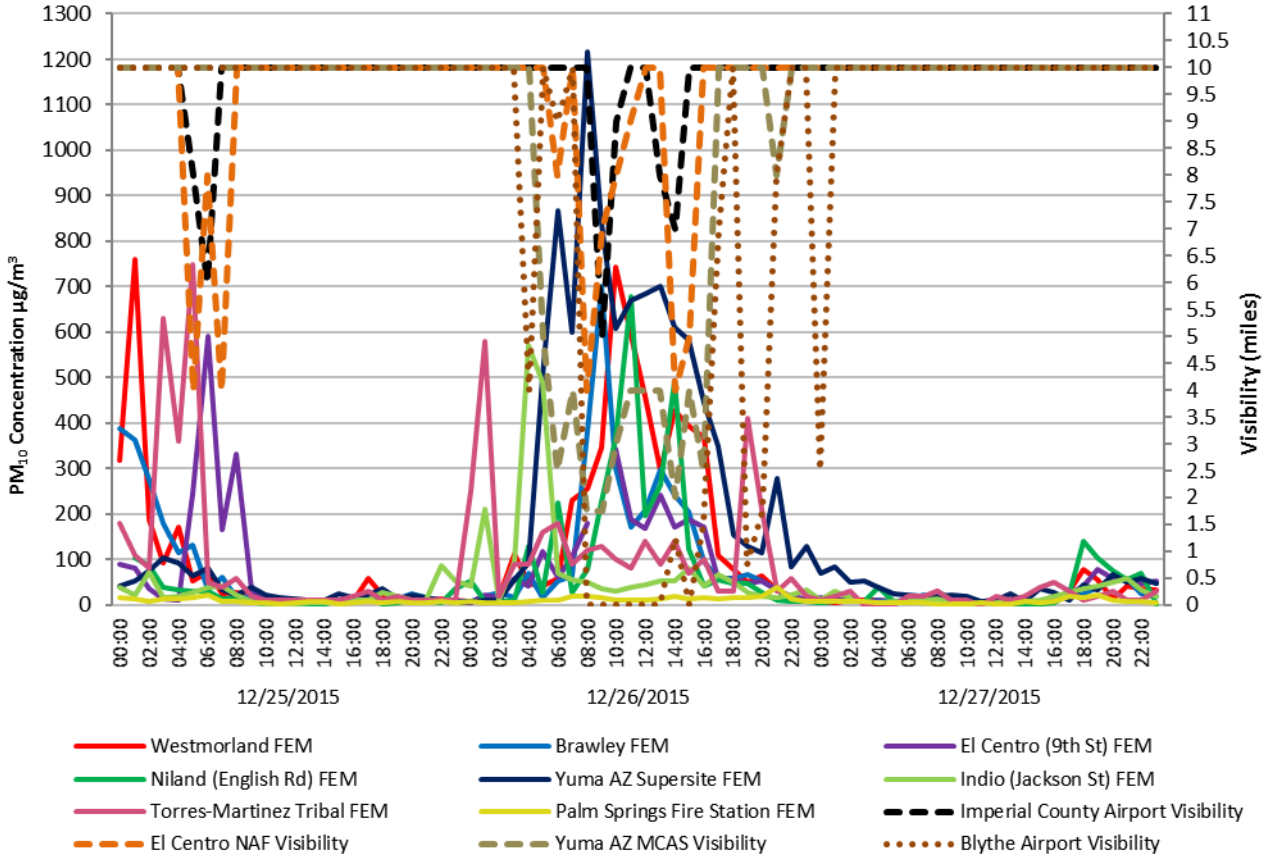


Fig 5-12: As windblown dust travelled south through Imperial County, elevated concentrations at the Westmorland monitor were coincident with reduced visibility at local airports. Although the visibility at Blythe looks like it is at zero, the actual reported values is 0.25 miles

Combined the analysis provided above demonstrates that air quality in Imperial County was affected with strong gusty northerly winds blew into Imperial County. An Air Quality Index (AQI) reflects an indication that air quality is affected, in either a positive manner or a negative manner.[21] As the air quality degraded, in Imperial County, the resultant AQI for Brawley on December 26, 2015 reflected the change (**Figure 5-13**). The AQI for December 26, 2015 remained "Moderate" (Yellow) from 0100 PST to 0200 PST. This is consistent with the passing of a previous system as a result the AQI remains "Good" or Green for eight (8) hours. However, as the northerly winds endured by 1000 PST the AQI level returns to a "Moderate" (Yellow) for the

[21] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://airnow.gov/index.cfm?action=aqibasics.aqi

remainder of the day. Based on all the foregoing air quality in Imperial County was affected when strong gusty northerly winds transported windblown dust into Imperial County overwhelming BACM in place.

FIGURE 5-13
AIR QUALITY INDEX FOR BRAWLEY DECEMBER 26, 2015

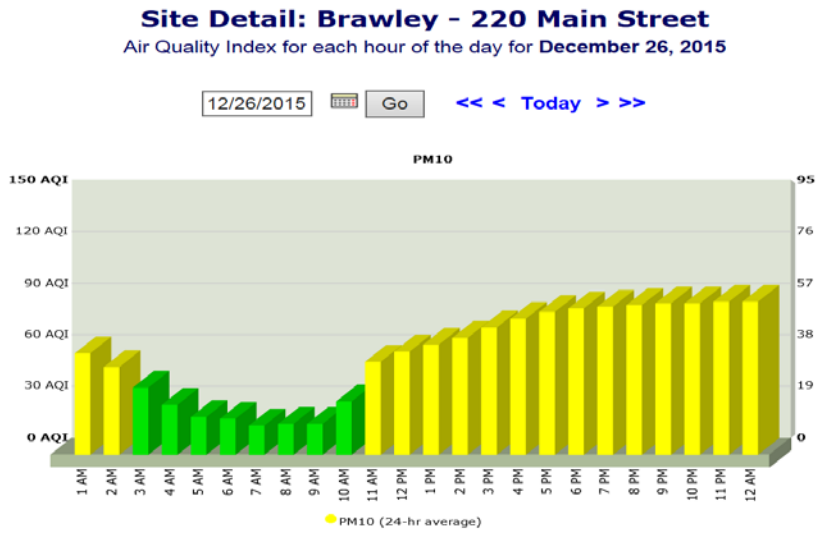


Fig 5-13: Demonstrates that air quality in Imperial County was affected when high winds transported windblown dust from natural open desert areas located to the north and northeast of Imperial County on December 26, 2015

V.2 Summary

The preceding discussion, graphs, figures and tables provide wind direction, wind speed and concentration data illustrating the spatial and temporal representation of the high pressure system over the Great Basin that brought high winds to the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Westmorland monitor on December 26, 2015. Furthermore, the advisories and issued air quality alert illustrate the effect upon air quality within the region extending from all of Imperial County to the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} were carried aloft by strong northerly winds into the lower atmosphere. The area of origin is the open areas of the Sonoran Desert, and portions of the southern Mohave Desert, located to the north of Imperial County. Combined, the information demonstrates that the elevated PM_{10} concentration measured on December 26, 2015 coincided with high wind speeds and that strong winds were experienced over the southern portion of San Diego County, Riverside County, Yuma County and Imperial County.

FIGURE 5-14
DECEMBER 26, 2015 WIND EVENT TAKEAWAY POINTS

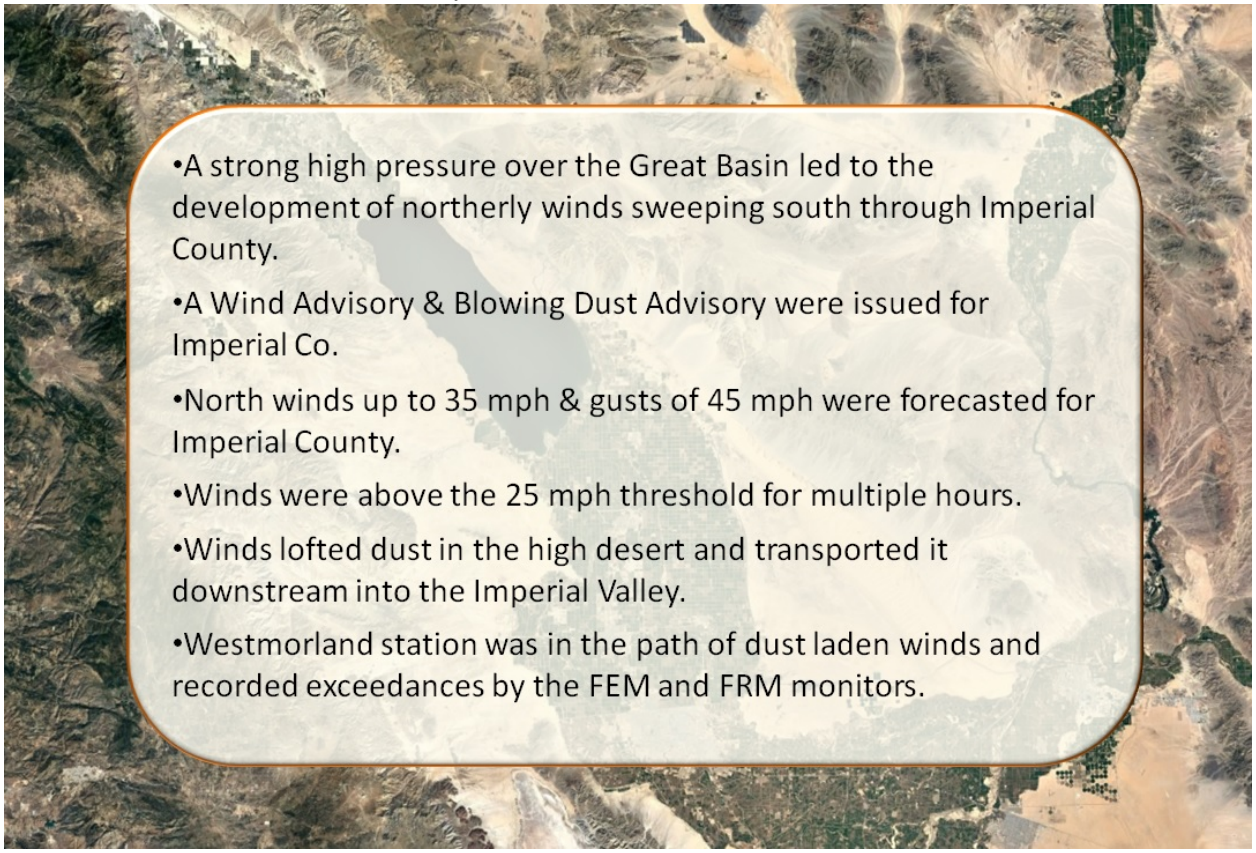


Fig 5-14: Illustrates the factors that qualify the December 26, 2015 as a natural event, which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on December 26, 2015, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

	TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})	DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-32
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	45-61
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	33-37
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	38-44
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	6-32 & 45-61

VI.1 Affects Air Quality

The preamble to the revised EER states that an event has affected air quality if the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the December 26, 2015 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played little or no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial

County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured by the Westmorland monitors and discussed within this report was caused by naturally occurring strong gusty winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert, and portions of the southern Mohave Desert, generally to the north of Imperial County. These facts provide strong evidence that the PM_{10} exceedance on December 26, 2015, was not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event with its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. Anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions. As discussed within this demonstration, the PM_{10} exceedances that occurred at Westmorland on December 26, 2015, was caused by the transport of windblown dust into Imperial County by strong northerly winds associated with high pressure over the Great Basin. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Westmorland during different days and the comparative analysis of different monitors in Imperial and Riverside Counties demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} on December 26, 2015 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on December 26, 2015.

VI.5 Historical Concentration

The historical annual and seasonal 24-hr average PM_{10} values measured at the Westmorland monitor were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1)(i))

This section contains a Wind Advisory and a Blowing Dust advisory issued by the NWS on December 26, 2015. In addition, this Appendix contains the air quality forecast issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and

wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind rose, etc. for selected monitors in Imperial and Riverside counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside counties. These graphs demonstrate the regional impact by the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.